MINING CONGRESS JOURNAL

TOBER, 1938

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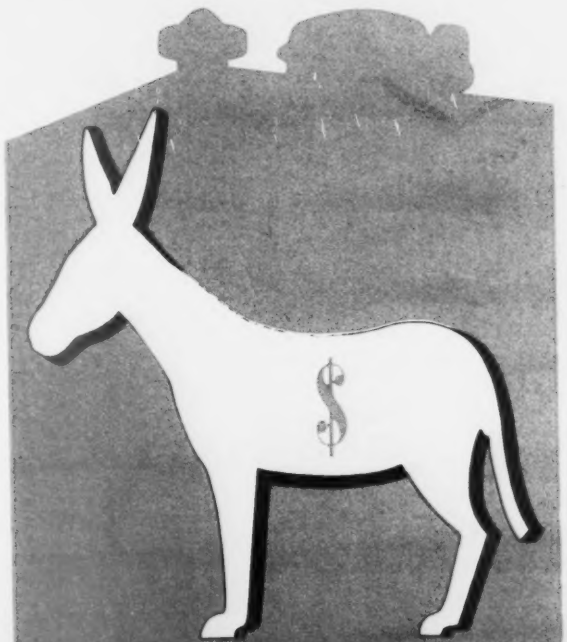


"EDISON'S STEEL MULE IS WORTH ITS WEIGHT IN GOLD..."

. . . say operators who know from long experience. Unlike other mules, its construction is of sturdy steel. This, plus its unique principle, makes it the most dependable, most capable power unit for mine haulage. It is the steel alkaline storage battery. Built for the toughest job—ready to take the inevitable rough usage occasioned by poor track, switching and derailment. Overcharging, over-discharging, rapid charging—even extended periods of idleness—do not harm it. It will get your trips through without delay, without failure. Investigate the story of this dollar-saving, trouble-dodging steel mule at Booth 211, Metal Mining Convention of the American Mining Congress.

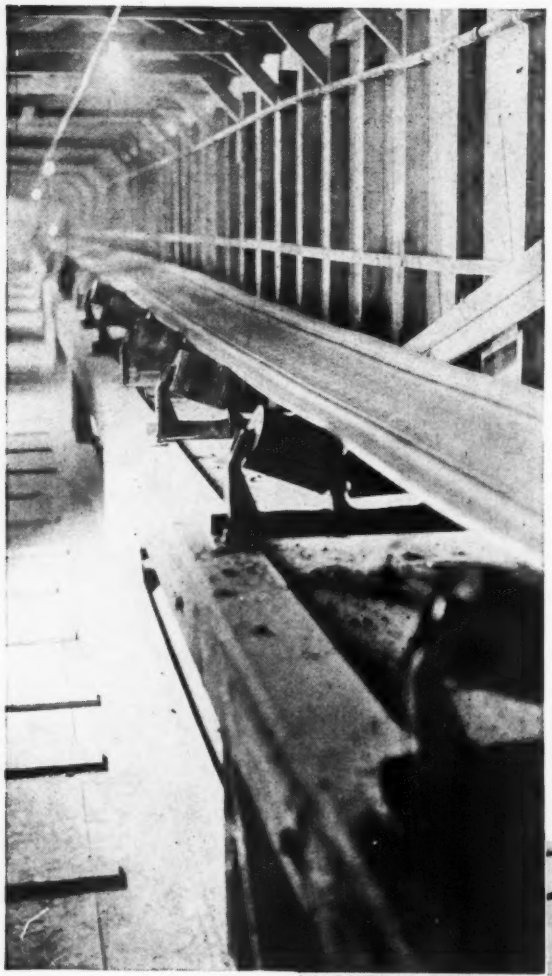
EDISON STORAGE BATTERY

DIVISION OF THOMAS A. EDISON, INC. • WEST ORANGE, NEW JERSEY

FFICIAL

LINK-BELT CONVEYORS

at Cariboo Gold Quartz Mining Co.



Among the users of Link-Belt conveying and power transmitting equipment in the famous Cariboo district of British Columbia, is the Cariboo Gold Quartz Mining Company Limited. The ore belt here illustrated is typical of those in this plant, and in mines in Canada and the United States, operating on Link-Belt anti-friction belt conveyor equipment.

We shall be pleased to engineer and supply your complete installation, or, if preferred, simply supply the parts desired. Whatever the inquiry, you may rest assured that it will be given prompt and painstaking attention, backed by years of experience in the art of handling materials mechanically and transmitting power efficiently.

LINK-BELT COMPANY

Chicago Philadelphia Indianapolis
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Baltimore . . Boston . . Buffalo . . Cleveland . . Dallas . . Denver . . Detroit . . Grand Rapids . . Houston . . Huntington, W. Va. Kansas City, Mo. . . Los Angeles . . Louisville . . New Orleans New York . . Oakland, Calif. . . Pittsburgh . . Portland, Ore. Salt Lake City . . Seattle . . St. Louis . . St. Paul . . Wilkes-Barre
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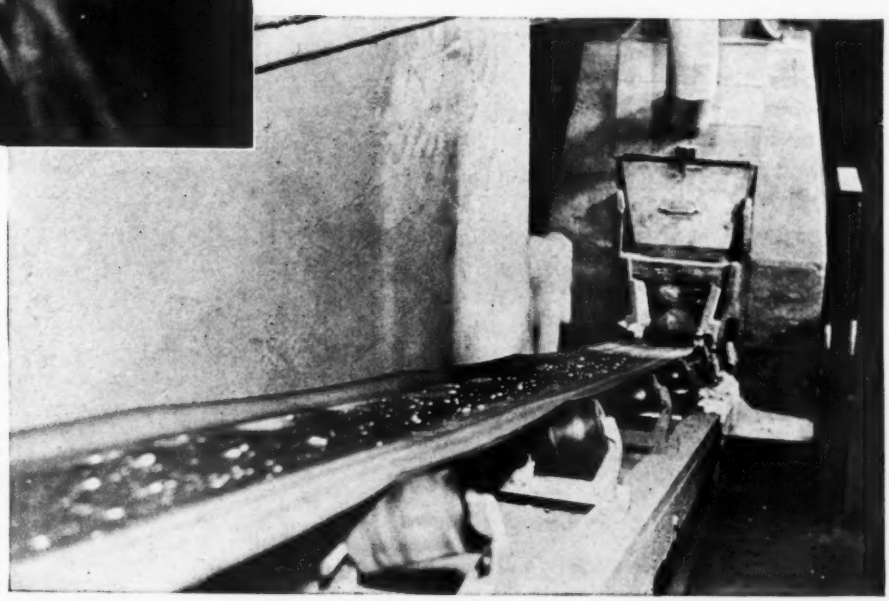
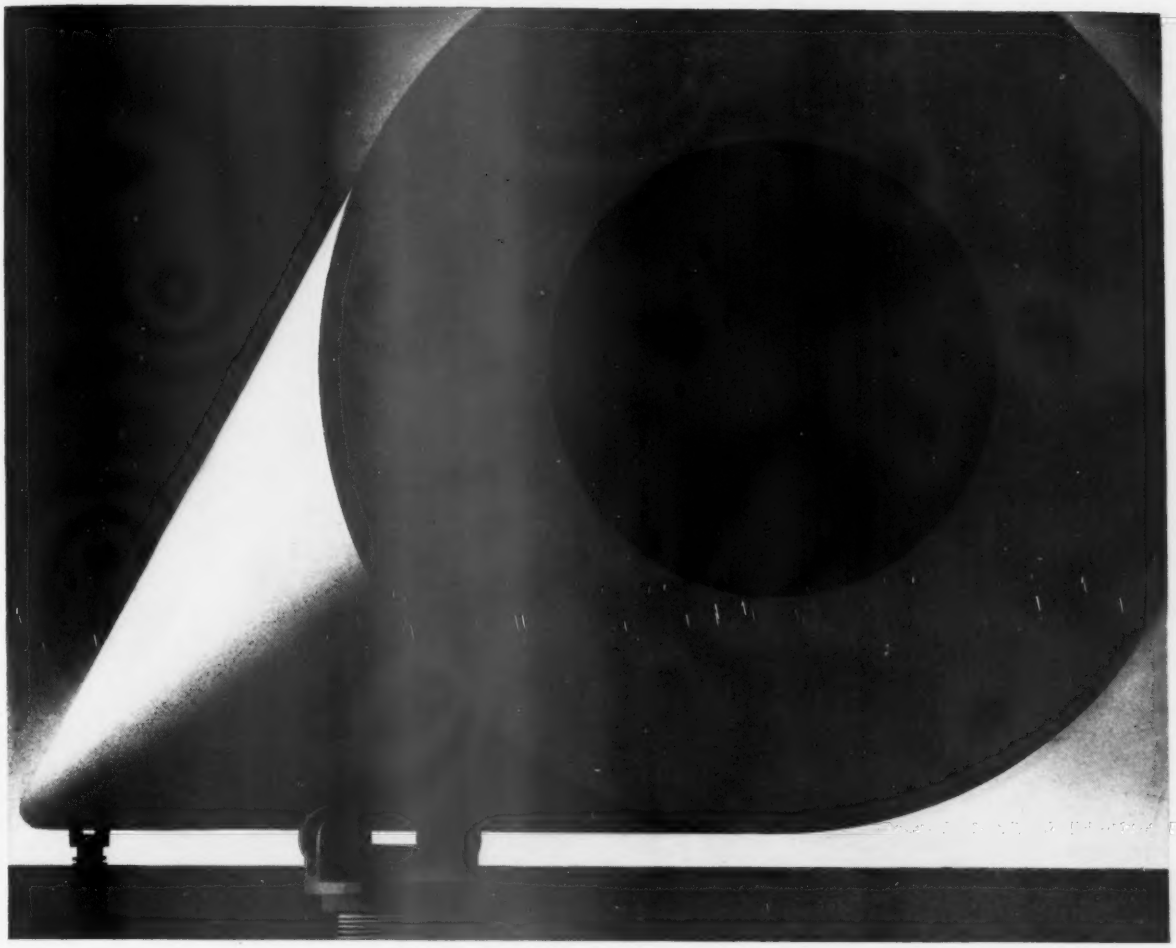


Link-Belt Products Include:

Belt Conveyors . . . Elevators and Conveyors of all types . . . Feeders . . . Vibrating Screens . . . Skip Hoists . . . Bucket Carriers . . . Portable Loaders . . . Speed Reducers . . . Variable Speed Transmissions . . . Silverstreak Silent Chain Drives . . . Silverlink Roller Chain Drives . . . Chain Drives of all types—Malleable Iron, Promal or Steel . . . Elevator Buckets . . . Pillow Blocks . . . Take-ups . . . Gears . . . Sprockets . . . Pulleys . . . Couplings . . . etc.

See our exhibit at the Metal Mining Convention and Exposition, Space 206, Los Angeles, October 24-27.



HUGE—YET UNIFORM IN PHYSICAL PROPERTIES

NECESSITY hastens many a discovery. When deep drilling in the oil industry created the need of extra-heavy, extra-durable drill collars, their service requirements and economical construction presented some new machine-shop problems. Among them was the finding of a steel which could be heat treated in long, massive chunks (sometimes 8 tons and 40 to 50 feet long) to produce uniform high physical properties and yet be readily machinable.

Chrome-Molybdenum (SAE 4140) steel proved the solution. It is widely chosen for this purpose because: (a) It develops the requisite physical properties. (b) It responds well to heat treatment—hardening uniformly through the large sections involved. (c) Its machinability at the relatively high hardness is excellent. (d) It is not susceptible to temper brittleness. And—with all its unusual fabricating and service qualities, it is comparatively inexpensive.

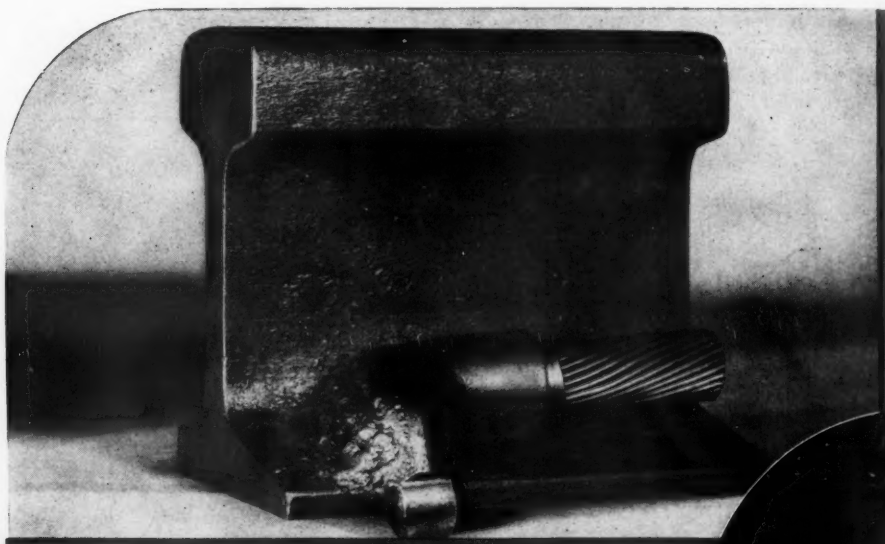
Have you heavy-forging problems involving peculiar combinations of service and fabricating requirements? There's a Moly steel, most likely, that's exactly suitable. Investigate. Our free book, "Molybdenum in Steel," will prove helpful. Climax Molybdenum Company, 500 Fifth Avenue, New York City.

PRODUCERS OF FERRO-MOLYBDENUM, CALCIUM MOLYBDATE AND MOLYBDENUM TRIOXIDE

Climax Mo-lyb-den-um Company

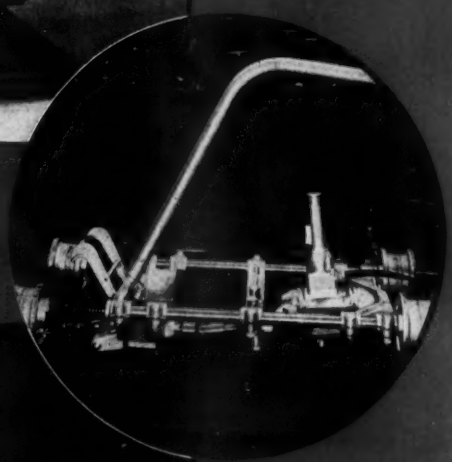
MOLY

O-B ANNOUNCES NEW



Above. The AW-20 bond needs only an inch and quarter of steel arc-weld to install it properly. Note how the steel hook clips over the rail base holding the bond in position for welding.

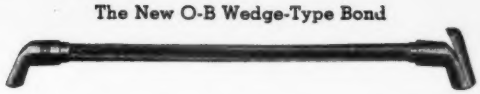
Below. The Wedge-Type bond is speedily installed and reclaimed with a couple of hammer blows. This feature also facilitates inspection of the drill hole.



Above. The O-B portable, power-driven drill, adjustable for all weights of rail, facilitates drilling of holes for the Wedge-Type Bond. Many mines, however, specify drilling of their rail at the mill.

The New AW-20 Hook-Type Bond

The New O-B Wedge-Type Bond



RAIL BOND DEVELOPMENTS

To Better Meet Your Return Circuit Requirements at Lower Cost

The AW-20 Steel Arc-Weld Bond Costs Less to Buy—Less to Install —Minimizes Power Loss—and Gives You These Definite Advantages:

1. LOWER RESISTANCE—provides shortest possible rail-to-copper-to-rail path for any given size of fish-plate.
2. SHORTER STRAND LENGTH—overall length need only be 6 inches longer than fish-plate instead of the usual 8 inches.
3. SMALLER WELD—only 1¼ inches of steel arc-weld are needed to provide lasting, positive mechanical and electrical connection, saving welding time, labor and materials.
4. EASY RECLAIMABILITY—terminal can be quickly pried off without injury and re-installed.
5. HOOK TERMINAL PROVIDES LONG LIFE—strand gripped by copper sleeve, to dampen vibration, and welded to terminal.

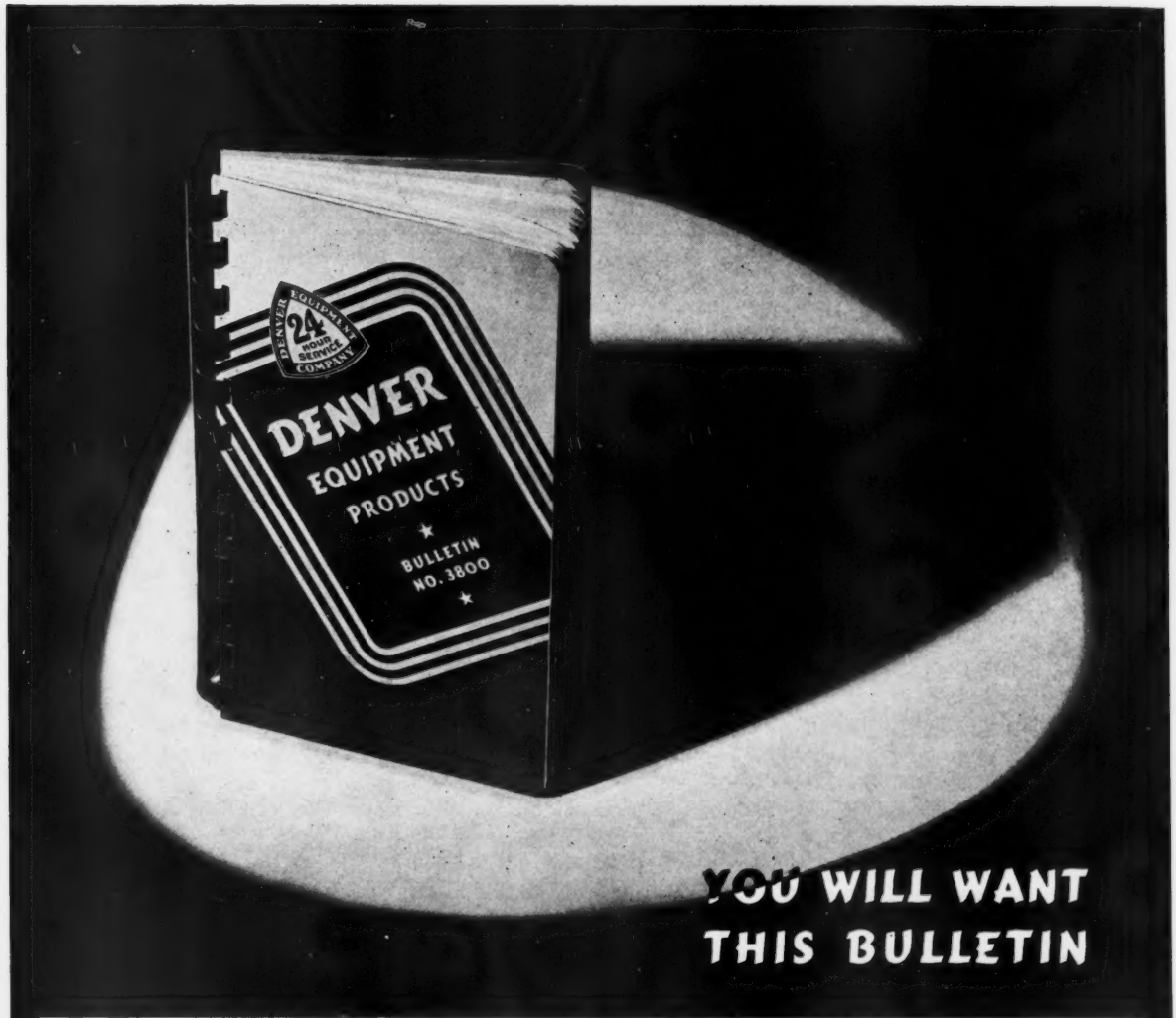
The Wedge-Type Bond Offers High Degree of Permanency—Speedy Installation and Reclamation—and Gives the User These Advantages:

1. INSTALLATION EASE—the terminal is slipped into a hole drilled in the web of the rail. A hardened steel wedge-pin, completing the circle, is then driven in with a couple of hammer blows, wedging the terminal securely and resulting in practically a perfect mechanical and electrical joint.
2. RECLAMATION EASE—a hammer blow on the end of the terminal and pin, from the other side of the rail, dislodges them and the terminal is ready for re-installation again and again.
3. SPEED—installation and reclamation are a matter of seconds, saving time and labor, speeding up mining operations.
4. INSPECTION—the wedge-type bond terminal can be be quickly knocked out for inspection of the drill hole.
5. TERMINAL STURDILY CONSTRUCTED—copper sleeve grips strand multiplying vibration life of bond tremendously.

OHIO BRASS

MANSFIELD · OHIO · U·S·A

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario, Canada



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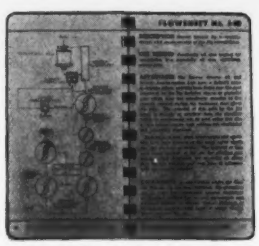
THIS BULLETIN

8 PAGES showing the hand of all machines which save time and money in planning



68 PAGES of the flowsheets which are now making more money throughout the world

128 PAGES which give data with description of Denver machines and developments

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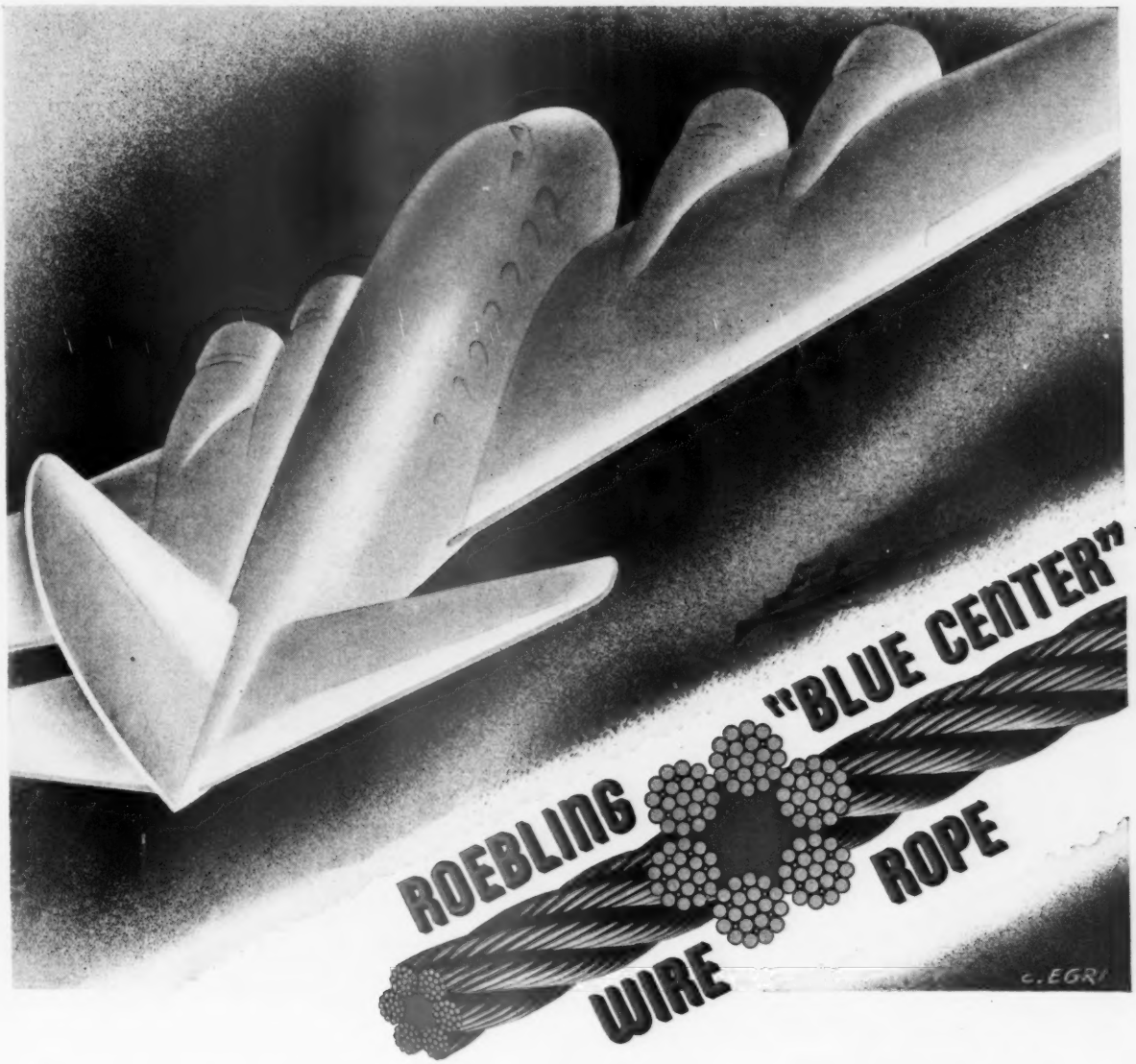
REACHING NEW HEIGHTS!



New heights of rope safety and economy are being gained through the use of Roebling "Blue Center". Investigate this rope, the highest development of Roebling's over 90 years of rope making experience.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N.J.
BRANCHES IN PRINCIPAL CITIES

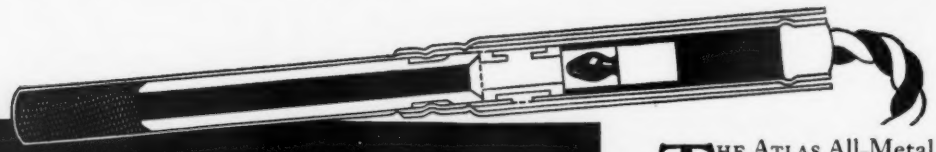
STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

SAFER—Unequalled for uniformity of quality

SAVING—Insures lowest general average operating cost

THE HIGHEST DEVELOPMENT IN ROEBLING WIRE ROPE



The *First* all-metal Delay Electric Blasting Cap in the field now offers *Still Greater Safety* with the introduction of ATLAS MANASITE

Another "ATLAS FIRST"

BLASTING CAPS
ELECTRIC BLASTING CAPS

ALL-METAL DELAY
ELECTRIC BLASTING CAPS

THE ATLAS All-Metal Delay Electric Blasting Cap was the first of its kind on the market. It set new standards of accuracy. Blasters have long regarded this cap as the criterion of dependable performance and of split-second firing regularity.

Now, this famous cap offers an added advantage—the greater safety of Atlas Manasite.

Atlas has developed a patented method of using hexanitromannite as an initiating compound. This has never been used before. It means a substantial reduction in sensitivity to impact and friction—a material increase in the margin of safety because it lessens the possibility of accident through inadvertent mishandling.

Greater safety has been attained without sacrificing detonating efficiency or firing regularity. The new Atlas Manasite Delay Electric Blasting Cap costs no more than the old type. It requires only the usual methods of storage and application.

Extensive use of Atlas Manasite Detonators has completely proved the value of this new development, now available in Atlas Delay Electric Blasting Caps. Ask the Atlas representative to tell you more about it.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

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ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

SHORTWALL COAL CUTTERS

Illustrated above is a Jeffrey 35-20 conveyor type shortwall cutter in thin-seam, conveyorized room-and-pillar mining. Powered with a 20-hp. motor, this machine is designed for cutting the softer seams. For cutting the harder seams in conveyor mining, Jeffrey offers its 35-BC (35-hp.) shortwall.

Mechanically, both machines duplicate the simplicity, and accessibility and ruggedness of design found in the time-tested Jeffrey continuous duty 35-B and 35-BB shortwalls. All four have fewer and heavier gears, shafts and bearings than has any other cutter of their kind. This feature alone contributes much to the traditional low maintenance and dependability of Jeffrey shortwall cutters. All are available for a.c. or d.c. operation, in open or permissible types. The Jeffrey Mfg. Co., Columbus, Ohio.

Track Type Machine—"Pat. and Pats. Pending — also licensed under the patents of E. C. Morgan." Patents Numbers 1,706,961, 1,706,962, 1,707,132, 1,707,133, 1,953,325, 1,953,326.

Jeffrey

A MACHINE FOR EVERY CONDITION

Here's one place you'll notice the difference

. . . with Exide-Ironclad Batteries

Exide
IRONCLAD
BATTERIES
With Exide **MIPOR** Separators
"MIPOR," Reg. U. S. Pat. Off.

Visit Exide Booth 220, American Metal Mining Congress, Los Angeles

A MORE rapid flow of ore out of the mine is one of the advantages you get by using Exide-Ironclad Batteries for underground haulage. The service is speeded up — not for just a few hours, or half a day — but all day long. Heavy loads and steep grades make little difference. The sustained voltage and high power ability of these batteries speed up production.

This extra performance costs nothing, for Exide-Ironclads are as economical as they are rugged and powerful. They are long-life batteries, trouble-free and easy to maintain. Over their long span of life, they consistently improve haulage service and cut costs.

These are the reasons why Exide-Ironclads are the most widely used batteries in underground haulage service today. Write for free booklet, "The Storage Battery Locomotive for Underground Haulage."

To mark the fiftieth anniversary of Exide Batteries, a handsome souvenir booklet has been prepared, illustrating the essential part these batteries play in daily life. Write, and we will gladly send you a free copy.

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Exide Batteries of Canada, Limited, Toronto

LUDLOW-SAYLOR WIRE CO.
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Long-Slot Woven Wire Screens

STA-TRU screens are specially designed for screening machines with tensioning devices which tend to stretch the crimps in ordinary screens when under load.

The straight stay-bars in STA-TRU have no crimps to stretch. They carry the full load of tension and vibration.

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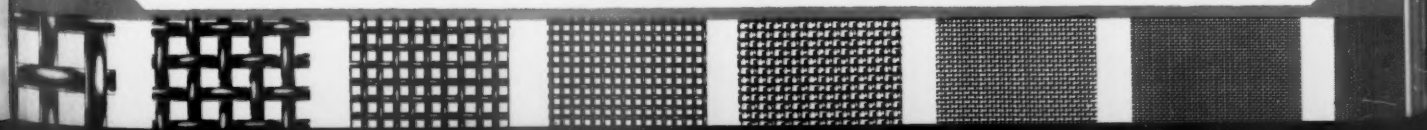
The longitudinal wires in STA-TRU screens are all in one plane between their intersections, so that all the long openings are of uniform width throughout their length.

Ask for bulletin and samples. Quotations are furnished promptly on receipt of specifications.

"The Perfect" WIRE CLOTHS and WOVEN WIRE SCREENS

— Steel — Super-Loy — Galvanized — Tinned — Monel — Nickel — Brass — Bronze — Stainless —

The LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS



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"Perfect" weaves have the *specified* number of wires per lineal inch, throughout their area.

The mesh counts *as specified,* in shoot as well as in warp.

The wires are spaced with pains-taking precision—they lock themselves in place at every intersection—they can not creep or rub together or saw against each other.

All wires are of specified diameter, composition, color, temper and general appearance, and of the finest metal or alloy obtainable in the grade specified.

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The LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS

Hercomite* and Gelamite* will knock out more rock for your money. They'll lay it down so the shovel can eat it up without a halt. They'll whale the daylights out of costs, too. You can get these modern explosives in many strengths and grades to suit all kinds of work. Mail the coupon for the complete story.

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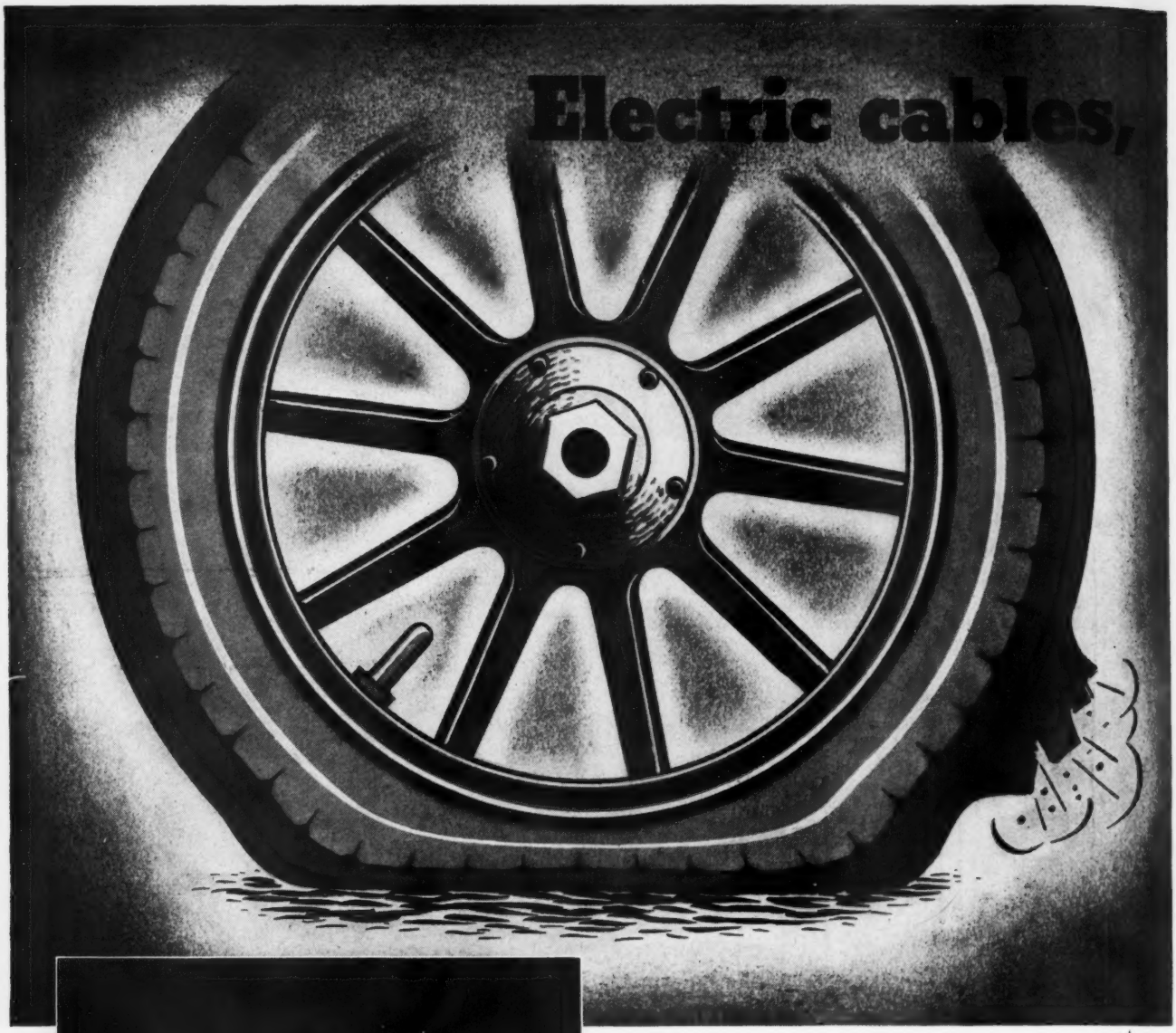

Anaconda Duraseal
used as main primary feeder

Chosen because of ability to resist abrasion and withstand direct contact with mine floor

In a mine of the Detroit Rock Salt Company, Anaconda Duraseal Type D was chosen as a main primary feeder for the substation because of its uncanny ability to resist abrasion and to withstand direct contact with the salt floor of the mine. Duraseal is a non-metallic sheathed cable, with a remarkable record in difficult service—because of the effectiveness of the sheath against mechanical damage and organisms causing mold and rot. It forms a durable seal over the insulated conductors—hence its name, Duraseal. A natural for service in mines and similar locations. Write for Publication C-27 describing Duraseal—a typical example of Anaconda cable research.

USE MODERN IMPROVED *Anaconda Wire*

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Subsidiary of Anaconda Copper Mining Company

like tires, have improved!

You don't ride on "1911 model" tires . . . neither should you use wires and cables of that same vintage. They're too expensive to use today!

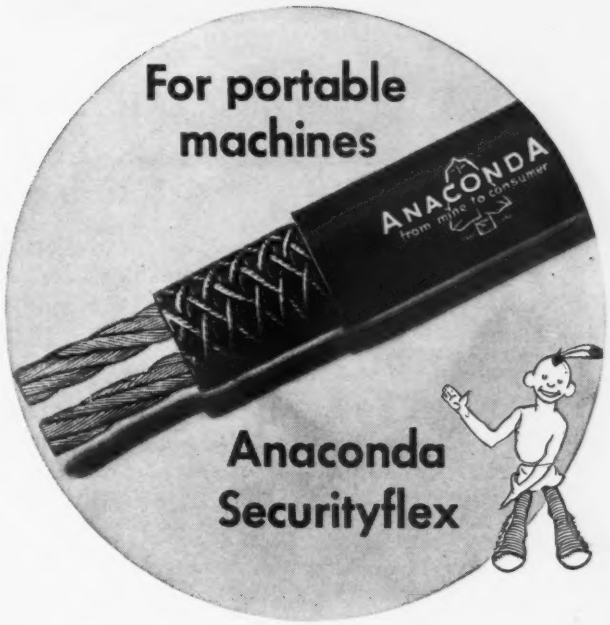
REMEMBER how punctures and blow-outs took the joy out of motoring in the early days? Certainly nobody could sell you "1911 model" tires today. Electric cables, too, have been improved and perfected—just as tires have been. In this development of better cables, Anaconda research has played an important part.

Specify Anaconda—save money

Our engineers have developed new and interesting insulations, more effective saturants and finishes—in a word, have *built in quality* that means better value for cable users. Shown at the right is Securityflex—one example of a better cable born of Anaconda research. At the left is Duraseal—another Anaconda cable that saves money for users. These are but two of many modern cable developments by Anaconda.

Use our advisory service

Our staff engineers are prepared to give immediate assistance to engineers having difficult or unusual problems in the design or application of wire and cable. Their services are available at all times to assist in the solution of technical wire problems, or in the development of special cables. 39455



Toughest mine cable you can buy

Here is a cable jacketed with a covering like today's automobile tire. The sheath is 60% mold-cured rubber. There is as much difference between Anaconda Securityflex and old-fashioned cable as between the modern automobile tire and that of the early days.

Mining companies use Anaconda Securityflex on movable equipment such as loaders, cutters, conveyors, drills and locomotives. The high-grade rubber insulation on the individual conductors assures electrical safety. Pick this cable for your most severe operating conditions. Securityflex will last longer, stand more abuse, and in every way deliver more for your money. Get the full story . . . ask for Catalog No. 351.

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from mine to consumer

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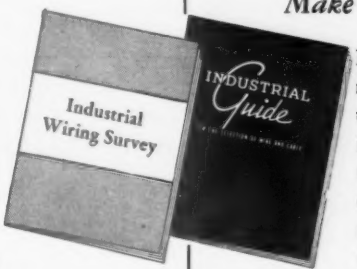

Avoid Breakdowns!

Make a check-up of electric circuits

Nine out of ten power users today are wasting money needlessly by failure to modernize electric circuits. Why not find out where savings can be made in your mines? Send for these two books. They tell how to make a check-up. Anaconda engineers will collaborate with your maintenance man, electrical engineer, or electrical contractor.

use Longyear

DIAMOND DRILLS FOR RAPID LOW-COST CORE DRILLING

ABOVE — LONGYEAR PROSPECTOR AIR DRILLING UNDERGROUND IN A GOLD MINE

BELOW — LONGYEAR JUNIOR STRAITLINE WITH TWIN-CYLINDER HYDRAULIC SWIVEL HEAD

On surface or underground they go after footage and keep drilling costs down. The Longyear line gives you the best in diamond drills. There are models to meet every drilling requirement with capacities from 100 to 6500 feet. Drills are available with either air, electric, gas, or steam motive power as desired. Two models are illustrated.

For an underground drill, the air-driven Longyear Prospector is ideal. It is light, compact, and easily moved. 300-foot holes at any angle may be drilled from set-ups in drifts or narrow mine workings. With almost no vibration, ample power and high bit speeds, bortz can be used in hand or mechanically set bits. Faster drilling progress, saving in diamond wear and lower drilling costs are assured. Write for Bulletin MC51.

The Junior Straitline with gas motor drive is just the drill for surface work where holes up to 750 feet are required. The big feature is the direct delivery of power from the motor through a clutch and four-speed transmission to the drilling head. This gives a steady, smoothly turning bit with consequent reduction in diamond wear. The Junior Straitline is equipped with a twin-cylinder hydraulic swivel head. Its over-all length is shorter than in the single cylinder head, permitting increased compactness of the entire outfit. A screw feed head is available if desired. Bulletin MC42 will be mailed upon request.

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Ever since the turn of the century, Traylor has served the mining industry, and we are highly appreciative of the friends we have made—and kept—through the years.

We have kept these friends and made new ones because wherever mining equipment is used, whether jaw or gyratory crushers, intermediate crushers, reduction crushers, crushing rolls, ball mills, rod mills, furnaces, converters, casting machines—there it has been found that the name "Traylor" on any of these means "next year's machine now."

The facilities that we have instituted and maintained for the benefit and profit of the mining industry are yours —use them to the full—consult us on any problem you may have—we'll solve it, surely, quickly.

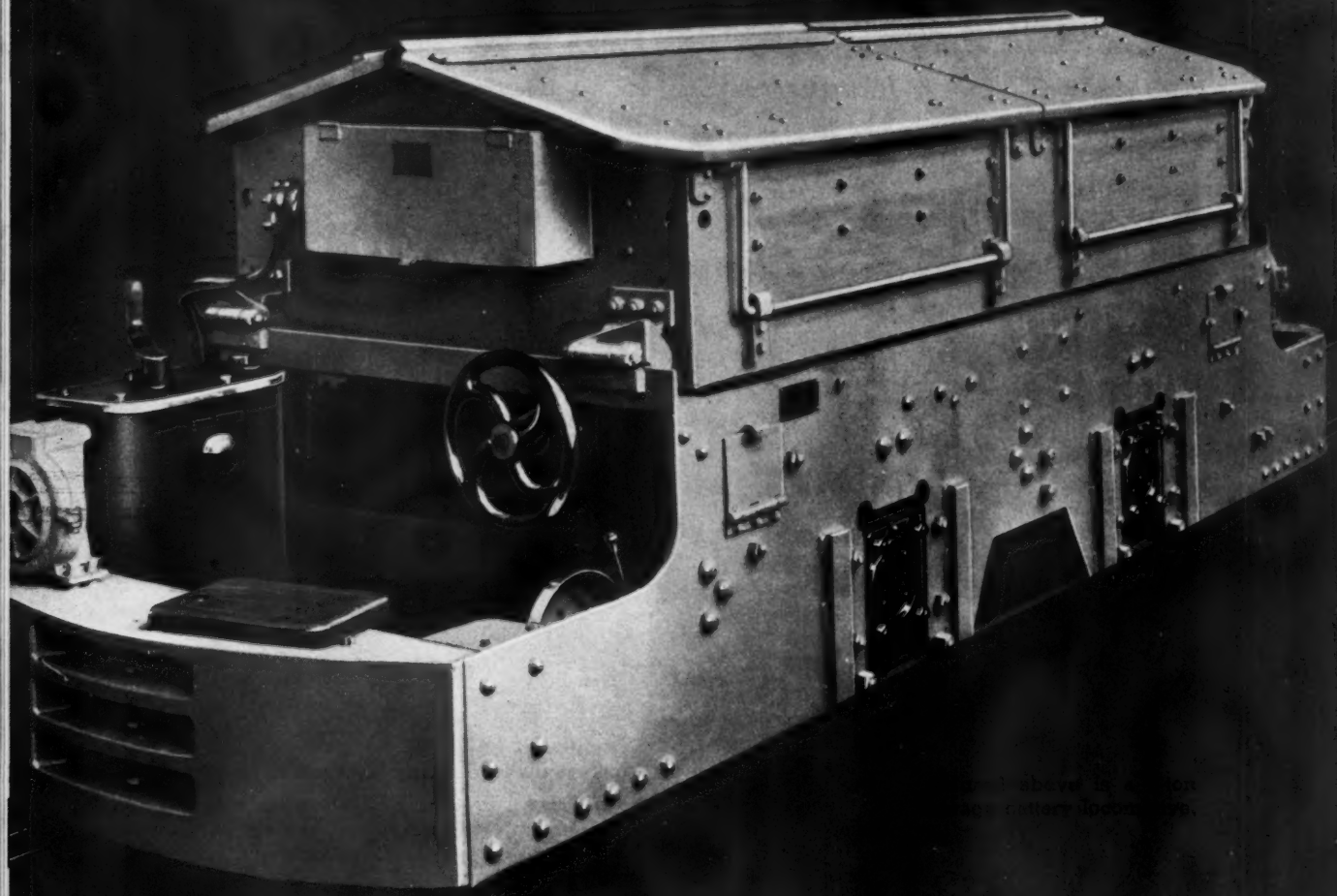
VISIT OUR BOOTH NO. 208 at the 5th Annual Metal Mining Convention and Exposition, Ambassador Hotel, Los Angeles, Calif., Oct. 24-27, 1938. We have something to show you—new—interesting—instructive!

TRAYLOR ENGINEERING & MANUFACTURING CO.

ALLENTOWN, PENNA. U.S.A.

From Lightest Tramming

to HEAVIEST HAULAGE



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MINING CONGRESS JOURNAL

Vol. 24 OCTOBER, 1938 No. 10

Rupe Sherwood, author of "Me and 'Prunes'", the fine tribute to his faithful burro appearing on page 53, was for long years a well-known prospector in Rocky Mountain areas until his death in Fairplay, Colo., in 1931, aged 82. So well known and admired was his attachment for "Prunes" that people in the community joined in erecting a monument to the faithful animal; and when Sherwood passed on, his ashes were deposited at the monument in accordance with his wishes.

—*Courtesy* J. G. PUTERBAUGH, President, The McAlester Fuel Co.

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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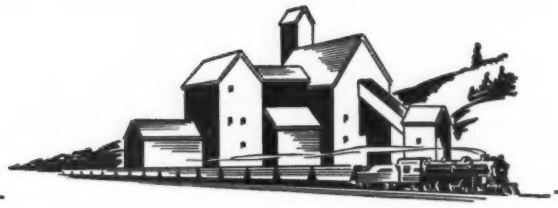

Labor Relations

NO GREAT industry has less fear of labor troubles growing out of demands for higher wages than the mining industry, because no industry, as a whole, pays higher wages. No industry, on the other hand, has greater fear of interferences with executive control than the mining industry, because of the unusual hazards of mining, in which disobedience to orders or the failure to observe safety precautions may cause disaster and heavy loss. Due to these conditions the mining industry is particularly interested in every movement looking to any change in the National Labor Relations Act.

This law and supporting legislation as framed has resulted in shackling employers in their relations with labor, under the pretense of securing more complete collective bargaining. The law, furthermore, has decidedly weakened the part employers can play in defining the conditions under which their operations are carried on.

One faction of the labor movement, finding that the bolting faction was getting all the advantage under the provisions framed to coerce employers into meeting the demands of organized labor, now favors amendments which will protect it from further encroachments.

If the changes proposed should be enlarged to provide for more equitable treatment of the employer, it would go a long way toward reestablishing true collective bargaining between management and labor. This would make possible the intelligent investment of capital in those enterprises which are necessary to the reemployment of men now working for the government in non-productive projects—projects paid for by borrowed money resulting in debts that stand as an increasing threat to profitable enterprises. It would seem that if bargaining, collective or otherwise, is to be made the rule of labor relations, both parties to supposed bargains should be consulted.

One thing may be laid down as a fact—namely, that industrial prosperity will never fully prevail so long as the right to bargain is so limited that the entrepreneurs of enterprise are denied the right to adjust costs of production to market returns in an equitable manner.

There is every reason why all labor should continue to find employment until production has passed the point of saturation, which means that up to that point the submerged one-third shall have for use, at prices which they can pay, all of the necessities and many of the luxuries.

Every increase in market price makes this situation more difficult of attainment. Every limitation on the law of supply and demand necessarily makes living conditions of the so-called submerged third less desirable.

An organized minority seriously threatens representative government by demanding under threats of reprisal the enactment of laws for the benefit of organized labor, which benefits are denied to other workers.

The right of bargaining does not belong to organized labor alone. The right of employers to be a part of the bargain should not be ignored, and so long as this requirement is not met it will be necessary for the taxpayer to make up the difference between orderly creative industry and wasteful un-American governmental spending.

A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

Vol. 24 OCTOBER, 1938 No. 10

Richard J. Lund, Editor

LAST CALL TO LOS ANGELES

Within some ten days metal mining men from all parts of the country will assemble in Los Angeles for the 5th Annual Metal Mining Convention and Exposition of the American Mining Congress, Western Division. As a real incentive toward more effective effort in promoting the general welfare of metal mining, this meeting is of incalculable value to each and every operator.

A large group of prominent mining men has spent unsparingly of their time in arranging a series of stimulating discussions of paramount importance to the industry today, in developing an intensely interesting display of latest developments in mine equipment and supplies, and in setting the stage for a week of pleasant relaxation in this "playground of the West." Those who have been regular attendants in the past well know the value of these meetings, both to the individual and to the entire industry.

Turn to pages 54-66 to get an advance showing of what awaits you. Get a real "lift" by coming to Los Angeles October 24-27!

LIMITATION OR ADVANTAGE

A SHORT time ago the attention of engineers and operators was directed through the editorial columns of another mining magazine to the fact that men engaged in metal mining might learn a lesson now and then from coal operators, and vice versa.

Although conditions for development and operation are radically different in the two fields of endeavor, it is true that in many phases of operations, such as underground transportation, ventilation, pumping, hoisting, illumination, power distribution, etc., many of the problems encountered are quite similar. The improved ventilation in coal mines, to which operators may justly point with pride, might well serve as an inspiration to betterment of this phase of operation at many metal mines. On the other hand, numerous operating aids such as skip hoists and aerial trams, developed and widely used by metal mining men, have been successfully applied in coal mining. Outstanding illustrations of the mutuality of interests in the two types of mining may be found in the number of operating men who have transferred with notable success from metal operations to coal and from coal to metal.

Included in each issue of the MINING CONGRESS JOURNAL are authoritative discussions of various operating phases of both coal and metal mining. Comments now and then indicate that such horizontal coverage necessarily implies wasted reading for "the other half." However, their mutual interests make it highly advantageous that progressive mining men keep abreast of important developments in parallel fields—perhaps, therefore, what might be regarded as a limitation may in actuality be a decided advantage.

GRADE OF ORE

SUCH is the title of a most instructive study just released by the National Research Project of WPA in cooperation with the U. S. Bureau of Mines. Presenting a wealth of detailed statistical information on average yield (quantity of metal and value) per ton of ore for innumerable districts and operations covering gold and silver, copper, lead and zinc producers, traced back as far as reliable records are available, the report is a most striking tribute to advances made in mining and metallurgical technique, without which the industry long ere this would have been bankrupt of minable deposits, and employment reduced to practically nothing.

Decline in grade of ore, it is succinctly pointed out, is one of the principal handicaps that plague the metal miner as his operation passes through its life cycle, and it "apparently will continue as a perennial challenge to the mineral technologist."

With the subject of technology as related to unemployment being mishandled so frequently of late, it is refreshing to have an authoritative study showing by direct implication what employment in mining might have been had these advances not been made.

Air view of producing area at the Haile mine, looking northerly. Old Haile and Bumalo pits at lower left; Red Hill and water reservoir at lower right; Chase Hill pit, right center; and Blue Pool, Blauvelt and Beguelin pits and cyanide plant, upper center. Terraced cotton fields also shown

GOLD MINING at the HAILE MINE in SOUTH CAROLINA

● ***Modern Methods Effective in Revival of Leading Appalachian Gold Producer***

By HARLAN H. BRADT
Managing Engineer
Haile Gold Mines, Inc.
New York City
and
EDMUND NEWTON
Mine Manager
Haile Gold Mines, Inc.
Kershaw, S. C.

Introduction

The Haile mine, embracing an area of 4 square miles, is located in Lancaster County, S. C., 3½ miles northeast of the town of Kershaw and 55 miles north of Columbia, the state capitol. It has been the outstanding and most successful gold-mining operation and the largest single producer of gold in the Appalachian region. Gold was discovered here in 1827, and the property has since produced nearly $4,500,000 (old price of gold) from somewhat over a million tons of ore, at about 70 percent extraction.*

*Note—Gold values used herein are computed at $35 per Troy ounce, unless otherwise stated.

It was at the Haile in 1889 that Dr. Adolph Thies, a German-trained engineer, successfully developed the so-called Thies barrel chlorination process for extracting gold from sulphide ores, which was afterwards used at many other places before it was superseded by the cyanide process. These former Haile operations were of such interest that the property was visited by the foremost mining and metallurgical engineers of that period.

In 1937 the Haile mine resumed production, using the most recent cyanide practice to recover the gold; and geophysical surveys, followed by diamond and churn drilling, have

been utilized to find new ore bodies. These modern methods of ore treatment and exploration have proven so satisfactory during more than a year of actual operation that we are now proceeding with construction, which will increase the milling capacity to 400 tons daily, and with development of newly found ore bodies which will supply that tonnage for many years. It is thought that a description of the present operation may be of interest to engineers and others.*

History

The original Haile property comprised part of the plantation of Col. Benjamin Haile, on which gold was discovered in a creek in 1827. The early work was confined to washing the banks and bottoms of this creek, but in 1829 the outcropping of a mineralized zone was discovered and mining of this was begun.

In 1837 a Frenchman, named Cugnot, built the first 5-stamp mill on the property, which is reported to have been the second stamp mill operated in the United States. Soon afterward other stamp mills were erected and chilean mills, arrastras and hand mortars were used.

The discovery of gold in California, together with the difficulty of working at depth, gradually led to the abandonment of operations in the 1850's.

During the Civil War the Confederates obtained considerable quantities of copperas and other chemicals derived from the pyrite ore deposits on the property, until the buildings and equipment were destroyed by Union troops on their march South.

In 1866 the Haile property was purchased by James Eldredge, and in 1880 appears to have been sold by him to a New York group, who placed E. Gybbon Spilsbury in charge as consulting engineer. Under Spilsbury's direction a 20-stamp mill was installed which operated successfully on ore that came from the oxidized zone above the water level. After two years sulphide ore was mined, and metallurgical difficulties arose. Many experiments were tried, but it was not until 1889 that Dr. Adolph Thies, who had come to the Haile in 1888, successfully worked out the so-called Thies barrel chlorination process.

From 1880 the property was oper-

*The U. S. Bureau of Mines has in preparation an Information Circular on the Haile which will contain the details of operating practice, equipment used, costs, etc. This present article is of a more general nature.

+ + +

OVER a wide belt, for a distance of 700 miles—from a point in Maryland, near Washington, D. C., southwestward to central Alabama—there are scattered gold-bearing deposits (see map). More than 1,500 individual properties within this area, known as the Appalachian gold belt, have produced and sold gold to the U. S. Mint since early in the last century. Appalachian gold mining flourished from the late 1820's to the outbreak of the Civil War in 1861; from 1870 to 1916 there was moderate activity. Considerably more than $50,000,000 of gold at the old price of $20.67 per ounce has probably been produced. Gold dust was used as currency, and gold was privately coined prior to the establishment of a branch of the U. S. Mint at Charlotte, N. C., in 1837.

The wide distribution of gold in a region close to the Atlantic seaboard, with a romantic background, has in the past attracted an undue proportion of embryo miners and metallurgists. Remarkable gold recovery processes, designed to catch both fine gold and unwary investors, have been exploited in this area by promoters who have found it a convenient field of activity. Property owners have made many a failing farm, carrying a few quartz veins and "colors," pay well by leasing or selling it under extravagant terms with a substantial down payment, then repossessing it and repeating the operation.

The reputation thus acquired, and the fact that the rich superficial parts have been mined out from most of the known gold deposits, have discouraged responsible mining concerns from seriously investigating the Appalachians. As a consequence the region, which enjoys exceptionally favorable climatic, transportation, and labor conditions, has not been explored or worked by modern methods now available, and the possibilities under such practices are as yet undetermined.

Our initial investigations of the Haile were undertaken with some apprehension, but the evidences of extensive ore bodies could not be ignored, no matter what general opinion of the Appalachians prevailed. Subsequent results have been most gratifying, as is set forth in this article.

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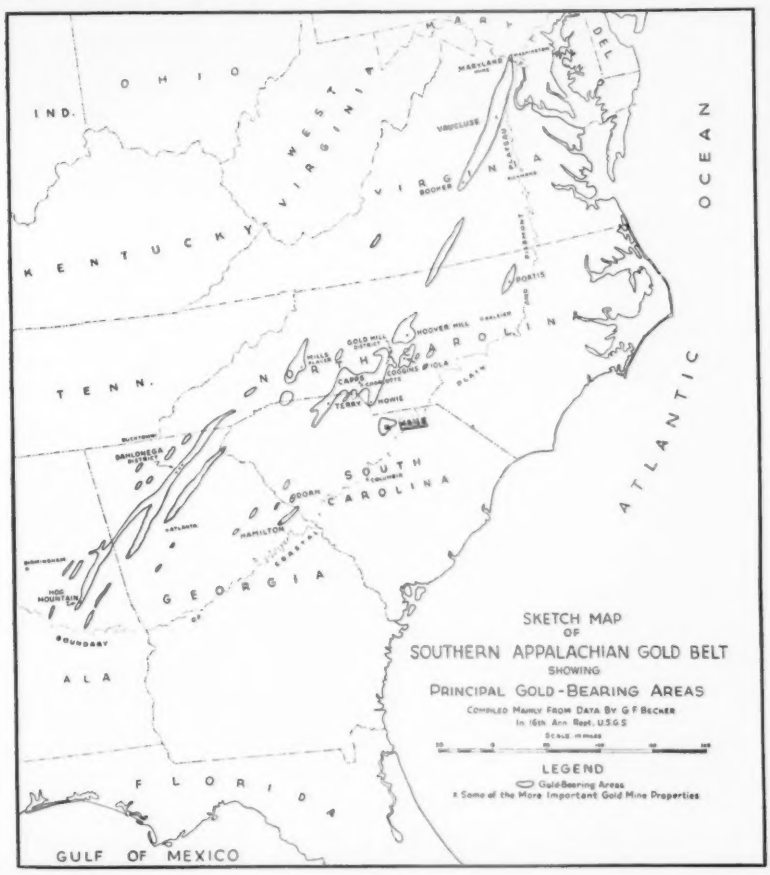


ated continuously—with an average production of about 25 tons per day for the first 8 years, and of about 125 tons per day for the next 21 years—until 1908, when a boiler explosion wrecked the 60-stamp mill and killed the then manager, Ernest A. Thies, son of Dr. Thies. The few stockholders of the Haile Gold Mining Company, then owners of the property, were elderly men, residents of New York and vicinity, who, lacking the leadership that Ernest Thies provided, decided to discontinue operations.

In 1911 John T. Stephens, of Kershaw, bought the property at a mortgage foreclosure sale and transferred it to Haile Gold Mining Corporation. In 1913 a small cyanide plant was erected on the property by that company to treat the richer tailings from the early operations. Due to lack of competent preliminary metallurgical investigation, the project was abandoned after several months of operating losses.

From August, 1915, to June, 1917, lump pyrite was mined by A. K. Blakeney from one of the deposits on the property for sulphuric acid manufacture. In June, 1917, the Kershaw Mining Company took over the property under a lease contract and started construction of a mill to concentrate 300 tons of crude pyrite ore per day. This mill operated below capacity from March to November, 1918, when coincident with the close of the World War the high price domestic market for pyrite collapsed and the lease was abandoned.

In 1934, following the increase in price of gold, Haile Gold Mines, Inc., newly organized, acquired the property under a lease-purchase contract from Haile Gold Mining Corporation. The Beguelin, Blauvelt, and Blue Pool pits were dewatered and sampled, revealing considerable ore of commercial grade in the Beguelin. In early 1935 a 100-ton "pilot plant" was completed near the Beguelin pit, from which ore was being mined in 1908 when the former operations were suspended. From February, 1935, until April, 1936, about 18,000 tons of crude ore were mined and treated and about 15,000 tons of tailings impounded. The process used in this pilot plant was simple amalgamation on plates, and only about 17 percent of the gold was saved while over $5 per ton was left in the reject.

We became interested in the property in the spring of 1936 and, after independent check sampling and metallurgical testing, designed the first 125-ton unit of an "all-sliming" cyanide plant. Haile Gold Mines, Inc., was refinanced, construction began in late January, 1937, and the plant was placed in operation in the middle of June of that year. Precipitation of gold began on July 1, 1937.

Hoisting, storage, crushing, conveying, and cyanide plants at the Haile mine. Second unit of cyanide plant under construction (left), and dragline stripping overburden from Beguelin pit at right

Previous Development

Under Thies, the Haile property was worked both by open-cut and underground methods. There are five old open pits—the Haile, Bumalo, Blue Pool, Blauvelt, and Beguelin — as shown in the accompanying aerial photograph and plan map of the producing area. Some of these pits were over 150 ft. in depth, according to old records, and there were several vertical shafts ranging from 50 to 350 ft. deep. The deepest workings, reached by a winze below the 350-ft. shaft, near the Haile pit, are reported to have extended to a vertical depth of 475 ft.

Previous Production

Published records show an approximate total production from the Haile property of 1,050,000 tons of ore, averaging $6.10 in gold per ton, having a total gross value of $6,400,000 (gold at $20.67 per ounce). From this ore, gold amounting to about $4,500,000 at the old price was saved, the recovery ranging from about 50 percent in the period 1829-1877 to 60 percent in the period 1877-1880, to 70 percent in the period 1880-1887, and to 82 percent in the period 1888-1908. The weighted average recovery was just over 70 percent. Computed at the now prevailing price of gold of $35 per ounce, the gross value of the ore produced from the Haile averaged about $10.35 per ton.

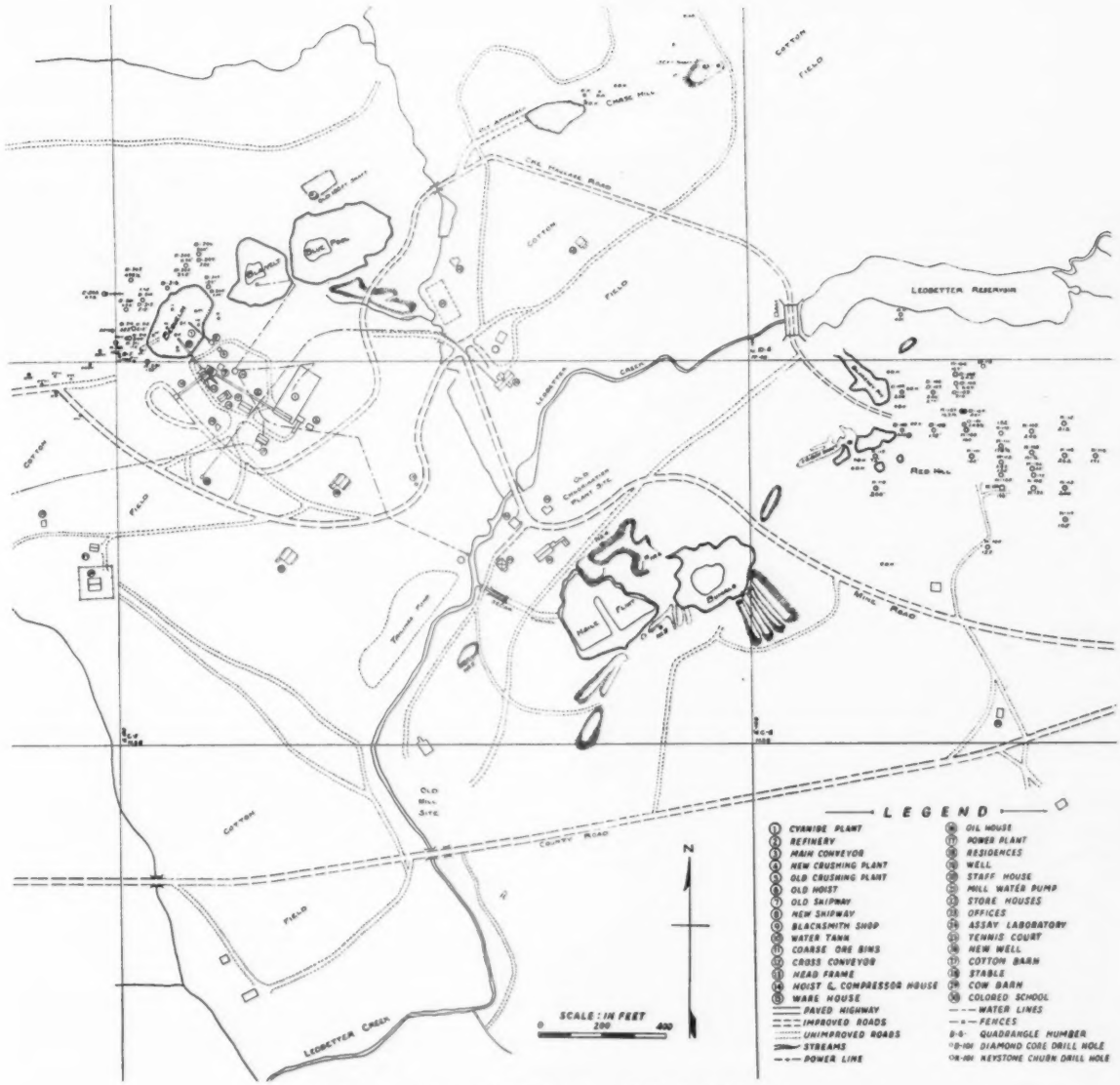
Geology of the Ore Deposits

Topographically, the Haile property is situated in the Piedmont Plateau adjacent to the Coastal Plain, in a gently rolling area, at an altitude of about 500 ft. Here the surface material consists of a relatively thin sheet of unconsolidated sandy sediments of Cretaceous age. In the immediate vicinity of the mine, from an area nearly a half mile square, the cover of Cretaceous sediments has been partly removed by erosion, and the underlying strata exposed.

These strata are classified as Pre-Cambrian schists and slates trending 50 to 70 degrees east of north and dipping 50 to 65 degrees to the northwest. A series of nearly vertical diabase dikes both large and small, ranging up to 200 ft. in width, strike northwesterly and cut the schists at about right angles to the schistosity; a few small dikes cut the schists obliquely. To the eastward of the Haile and perhaps also on the Haile property, the schists have been intruded by granite masses, probably of Carboniferous age. There is little apparent faulting.

Old operators partly explored and worked two large mineralized shear zones ranging from 1,500 to 2,500 ft. or more in known length; from 150 to 250 ft. in width; and extending downward at least 300 to 475 ft., the limits of the old workings. Lenticular and chimney-like bodies carrying commercial gold values were mined at various places within these zones.

The mineralized zones and adjacent barren country rock consisted originally of water-laid light gray andesitic tuffs which were metamorphosed to quartz-sericite schist and related formations. At a later period, probably Carboniferous, mineral-bearing solutions, emanating possibly from the near-by intrusive granitic magma, impregnated and replaced the schist with more or less quartz, pyrite, gold, and other minerals, in certain places along planes of shearing and fracturing that afforded easy passageways. Thus ore shoots were formed in the shape of lenses and chimneys of varying dimensions, ranging up to more than 100 ft. in width and several hundred feet in length. The gold



Plan map of present producing area, Haile Gold Mines, Inc.

occurs sometimes as metallic particles, usually of microscopic size, and as thin films on joint and slip planes, but mainly in an invisible form intimately associated with pyrite.

From the surface to a depth of about 150 ft., the schistose gold-bearing formations are irregularly and decreasingly weathered and oxidized to a soft material called "saprolite." Within this weathered area the gold content of the ore deposits has undoubtedly been somewhat enriched by the leaching of the gangue minerals, and also in part by the downward migration and concentration of free gold. The grade of the unaltered gold ore is lower beneath the weathered zone, and the ore bodies narrower, but borings show primary ore of good grade extending to considerable depth.

Mineralogically, average Haile ore consists mainly of kaolin, quartz, sericite, hematite, limonite, magnetite, auriferous pyrite, and some free gold with occasionally a very little molybdenite, rutile, copper and zinc sulphides and arsenopyrite, none of which are sufficient in amount to interfere with cyanidation.

Pyrite is widespread, occurring in fine grains or crystals disseminated irregularly through the rock or locally concentrated in bunches or bands in amounts ranging from less than 1 percent to almost pure pyrite, there being usually from 1 to 15 percent of pyrite present.

PRESENT OPERATIONS

Mining

When the first unit of the cyanide plant was placed in operation during June, 1937, it was fed with the amalgamation tailings from the pilot plant that had accumulated in 1935 and 1936. These tailings, aggregating about 15,000 tons, were sluiced to a sand pump which delivered to the mill.

In September, 1937, mining began in the Beguelin open pit. For the next few months the tonnage of the open-pit ore gradually increased, while that of the sluiced tailings decreased, until by the end of February, 1938, all tailings that could be economically sluiced had been handled.

Drillers at work on wall of Beguelin pit

At present practically all material treated is mined in the Beguelin open pit, which is about 300 ft. long, 175 ft. wide, and 90 ft. deep. The pit is kept unwatered by small electrically driven centrifugal pumps.

Since April, 1938, a new skipway, headframe, hoist and 300-ton coarse ore storage bin have been in use. The skipway lies on the footwall at an angle of 40 degrees. While the new headframe is now used to hoist ore from the Beguelin pit, it is so located with respect to the edge of the bin, and so designed, that it may also serve at a later time in sinking a vertical shaft to develop deeper lenses of primary ore that have been indicated by recent diamond drilling.

The surface plant is also arranged so that ore may be brought by truck from other parts of the property and carried by a belt conveyor to a separate compartment of the coarse ore bin.

Overburden from the Beguelin ore body is removed by a ¾-cu.-yd. Austin dragline mounted on caterpillar treads. About 10,000 cu. yds. per month are handled with the dragline at a cost of about 3 1/3 cents per cubic yard. About 2 cu. yds. of overburden are removed for each ton of ore mined.

A picking belt conveys the ore from the coarse ore bin to a jaw crusher, and a 16-in. belt delivers it to the fine ore storage bin inside the mill.

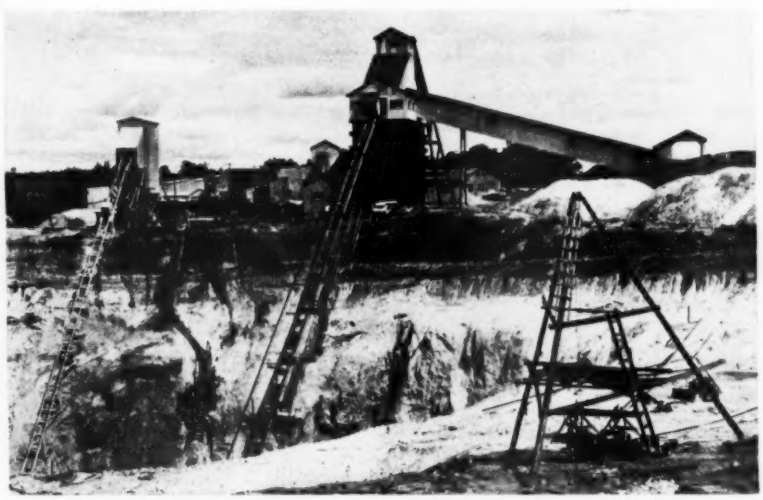
Milling

The ore treatment plant is based on the all-sliming, continuous counter-current decantation method of cyanidation. The first unit of the mill was designed for a capacity of 125 tons in 24 hours. However, when the full grinding capacity was installed, it was found that nearly 175 tons per day could be handled. The ore is ground in low-grade cyanide solution to about 80-90 percent through 200-mesh.

The accompanying flow sheet indicates the flow of solids and solution in the plant. Primary thickening is accomplished in a Denver thickener. The overflow of this primary thickener goes to the Merrill-Crowe precipitation unit. The underflow, consisting usually of about 60 percent solids, goes to two Denver side air-lift agitators. The overflow of the second agitator goes to a Denver three-compartment tray thickener, in which counter-current decantation is accomplished.

Cyanide solution from the low-grade solution tank is introduced in the ball mill and classifier with the fresh ore. To maintain the strength of cyanide solution, cyanide is added to the overflow of the top compartment of the tray thickener. The cyanide strength is maintained at approximately 0.4 lb. NaCN per ton of solution, or 0.02 percent.

The average pulp densities maintained are 17-18 percent for the classifier overflow, 60 percent for the pri-



Old (left) and new hoisting, storage, and crushing plants, with portion of Beguelin pit—cyanide plant in rear. Diamond drill outfit in right foreground; conveyor for truck ore from other pits at upper right

Looking southwesterly at Beguelin pit, showing wide orebody being stripped by dragline

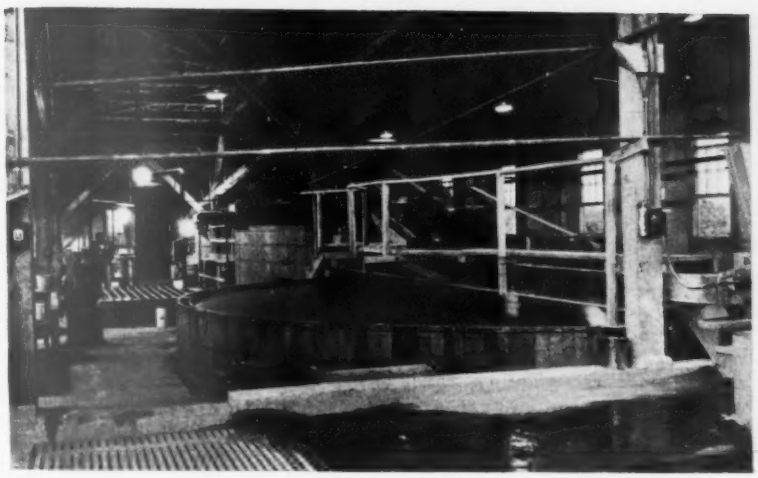
mary thickener, 47-50 percent for the agitators, and 60 percent for all compartments of the tray thickener.

Protective alkalinity and increased settling rate are obtained by keeping the solutions at a strength of about 1.4 lb. of lime (CaO) per ton of solution. The treatment period is about 36 hours in the agitators, 6 hours in the primary thickener, and 12 hours in the tray thickener, or a total of 54 hours.

In the tray thickener some wash water is used with the barren solution to bring the total wash up to 3 to 3½ tons of solution per ton of ore.

About 0.05 lb. of zinc dust is now used per ton of solution precipitated, and precipitation is practically complete.

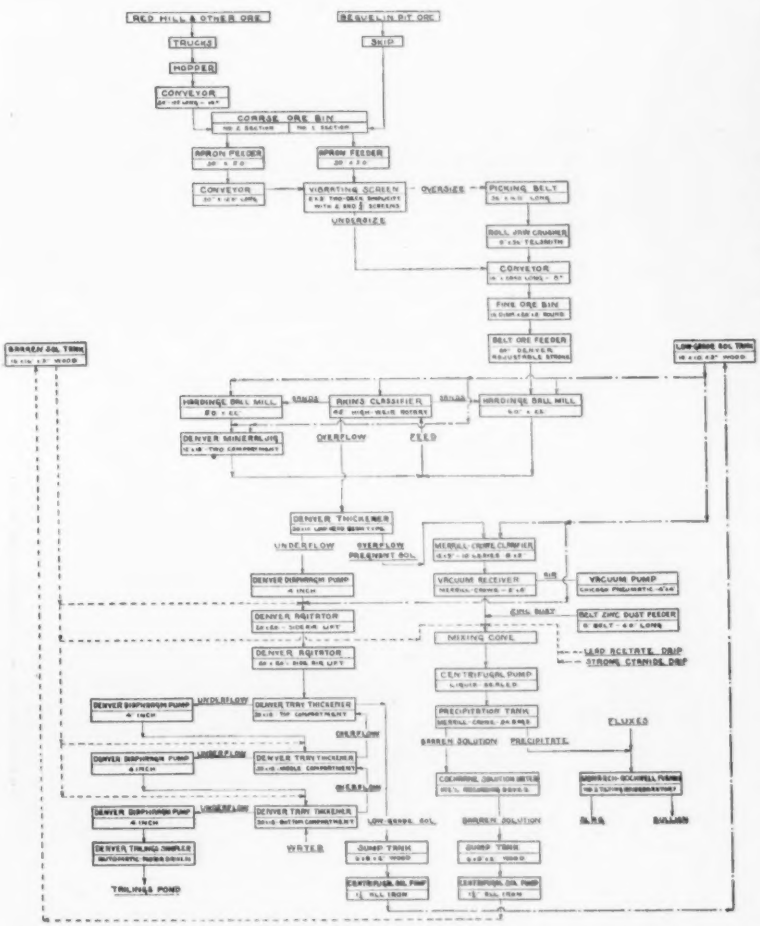
The barren solution, measured by a Cochrane flow meter, averages about 450 tons daily. Refining is done in a Monarch-Rockwell, oil-fired, tilting furnace.



Primary thickener, agitator tanks, and precipitation equipment in first unit of cyanide plant

Power

A 9-mile 13,200-volt line furnishes power at 440 volts. The rate is 1.35 cents for the first 50,000 kw.h., and 1.25 cents for the next 100,000 kw.h.



Flow sheet of first unit of cyanide plant

Pouring gold brick from Monarch-Rockwell furnace

Operating Results

The cyanide plant was placed in operation June 15, 1937. During the first two months it was fed exclusively with tailings. For the next six months the feed was partly tailings and partly open-pit ore.

Only half the grinding capacity was initially installed to handle the tailings which were already partially ground. The second ball mill was not put into operation until the end of the first eight months, and the operations for the last four months of the year were so improved that the results for the two periods will be given separately.

The total gold production for the year ending June 30, 1938, was $207,912.80.

ORE TREATED AND GOLD EXTRACTION
From July 1, 1937, to June 30, 1938

	8 Months to Feb. 28	4 Months to June 30	Total, 12 months
Feed:			
Total tons	27,184	18,242	45,426
Tons per day—average	105.4	149.5	119.5
Assay per ton—average	$5.01	$5.47	$5.24
Tailings:			
Assay per ton—average	$0.82	$0.38	$0.65
Extraction:			
Calculated percent—average	83.56	92.90	87.54

During July and August, 1938, the average feed amounted to 165.5 tons daily of $5.73 ore. The extraction averaged 91.80 percent, or at the production rate of over $300,000 annually.

The average per ton consumption of mill materials and total power during the period July 1, 1937, to July 30, 1938, was as follows:

CONSUMPTION OF MATERIALS AND POWER
Pounds and Kw.h. Used Per Ton of Crude Ore

	8 Months to Feb. 28	4 Months to June 30	Total, 12 months
Mill supplies used:			
Cyanide	0.47	0.35	0.42
Lime	7.60	3.15	6.43
Zinc dust	0.23	0.17	0.21
Steel grinding balls	2.52	0.85	1.85
Total power used:			
Kw.h. per ton crude ore	14.27	14.14	14.19

Direct operating costs for the same period are summarized as follows:

COST PER TON—CRUDE ORE

	8 Months to Feb. 28	4 Months to June 30	Total, 12 months
Mining	$0.65	$0.75	$0.69
Milling	0.78	0.65	0.73
Total	$1.43	$1.40	$1.42

Exploration

While the Haile property comprises 4 square miles in extent, all production has been confined to an area roughly 1,600 ft. square, or less than 60 acres, in part of which area the rock formations had been exposed by erosion of the Cretaceous sediments. Geologic conditions appear to be favorable for the occurrence of commercial ore bodies at many other places on the property which are partly or entirely covered by these sediments.

The present management has conducted an exploration program embracing channel sampling of exposed formations and a comprehensive geophysical survey of the company's entire property, followed by Keystone churn drilling and diamond core drilling of a limited section. Such methods have given excellent results so far, showing that they constitute a competent practice for this area.

Systematic channel sampling was commenced in October, 1937. Over 3,200 samples have been taken from the old pits, dumps, and tailing piles, and from about 2,500 ft. of new trenching. This work has shown the existence of commercial ore in several localities.

Perhaps the greatest single recent advance in the mining industry, from the standpoint of prospecting, has been the development of geophysics. This method of exploration is peculiarly applicable to the Haile deposits, which are of the lenticular type, relatively high in pyrite.

The geophysical survey was commenced in November, 1937, and to date over 3,500 acres have been surveyed by the auto-potential method using the potentiometer of a Gish-Rooney earth resistivity outfit and a potentiometer designed by Combined Geophysical Methods, Inc. North-south coordinate lines, previously established at 400-ft. intervals by a transit survey, are used as a control for the reconnaissance auto-potential survey. Readings are taken every 40 ft. When an anomaly is encountered of sufficient magnitude, the area is detailed, using a 40-ft. grid as a control.

Several of the auto-potential areas have been checked by the earth-resistivity method, using the Gish-Rooney instrument. The resistivity work is comparatively slow, but is deemed advisable as a check on auto-potential work before drilling is commenced. An Askania magnetometer is used for locating the position of the many diabase dikes cutting across the property.

Churn drilling with a Keystone Model 50-1 gasoline drill was commenced in November, 1937. To date, 28 holes have been drilled—23 on Red Hill, 2 at the west end of the Beguelin pit, 2 toward the northwest end of the property, and 1 water well. Holes are 6 in. in diameter and have averaged 172 ft. in depth, the purpose being to prove up only pit ore for the present. Spacing of holes is dependent upon the dip of ore encountered, and as a rule the interval is approximately 50 ft., holes being drilled in rows 50 to 100 ft. apart. The sample interval is 5 ft.

Following is a summary of footages

Gish-Rooney earth resistivity outfit and geophysical survey party at the Haile mine. Askania magnetometer is also used to trace diabase dikes

and costs for the first 26 Keystone holes drilled:

Total footage, ft.	4,375
Total cost	$5,863
Average cost per ft.	$1.34

*Before amortizing cost of equipment but including cost of sampling, assaying, filing and supervision.

Diamond drilling was commenced the middle of February, 1938. A Mitchell No. 11-E gasoline drill was first purchased and later a Sprague & Henwood No. 138 gasoline drill. To date 28 holes have been drilled—16 in the Beguelin area, and 12 on Red Hill. Size "EX" bits and rods are used, giving a core diameter of ⅞ in. The depth of diamond drill holes has ranged from 75 to 573 ft., averaging 281 ft.; the greatest vertical depth reached is 547 ft. The angle of drilling is dependent upon the location, and varies from 10 degrees from the horizontal to vertical. There is no predetermined spacing of holes, this being governed by the results obtained.

It has been found that diamond drilling is the most satisfactory method for following up the geophysical survey, both from the standpoint of results obtained in a given time and unit costs. It is possible to make long cross-cuts through the rock formation by drilling low-angle holes.

Following is a summary of footages and costs for the first 25 diamond drill holes put down:

Total footage, ft.	7,058
Total cost	$8,771
Average bit cost per ft.	$0.286
Average total cost per ft.	$1.243

*Before amortizing cost of equipment but including cost of sampling, assaying, filing and supervision.

Results of Exploration

Exploration was started November, 1937, and the early geophysical work indicated a large "anomaly" a little to the east of the war-time pyrite workings on Red Hill. At this point, since late in November, 1937, 21 churn and 12 diamond drill holes have been put down, and drilling is still in progress. While there are not sufficient data to complete a detailed estimate of tonnage and grade, it is indicated that this Red Hill ore body contains several hundred thousand tons averaging over $6 per ton in gold and is probably larger than any of the ore bodies opened and mined by the operations prior to 1909. This is attractive strictly as a gold ore and, in addition, it carries an appreciable amount of sulphur in the form of iron pyrite.

As the geophysical work has progressed, 19 anomalous areas other than "Red Hill" have been found and mapped in detail up to the present. None of these anomalies has yet been drilled, but all of them represent mineralized areas.

Above: Engineering, geophysical and office staffs and foremen at the Haile mine

Left: Supervisory personnel—left to right, Edmund Newton, M. C. Sherrill, D. B. Gregg, H. S. West and Harlan H. Bradt

Second Unit of Cyanide Plant

Construction of the foundations and building for the second cyanide unit has been completed, and most of the equipment installed. This will be approximately a duplicate of the first unit, except that the steel agitator tanks will be 22 percent larger, and tray thickener 14 percent larger, and 6-in. pumps will be installed.

It is expected that the second unit will be in operation by November, 1938, and with the change from 4-in. to 6-in. pumps in the first unit, the total mill capacity will be 400 tons per day.

Red Hill Gold Orebody

It is planned that the second mill unit will operate mainly on ore from Red Hill, smaller amounts to come from the old Beguelin and new Chase Hill ore bodies. The shape and size of the Red Hill ore body are such that it is being stripped with a 1-cu.-yd. Northwest dragline, and a large tonnage will be minable from open pit. The dragline will load ore into a portable hopper, from which it will be drawn into trucks and transported to the outside belt conveyor at the cyanide plant.

Pyrite By-product

The Red Hill gold ore body is located just eastward of the workings from which considerable pyrite was removed during the World War, and it also carries a high pyrite content in addition to its gold value. It is intended to recover the pyrite by flotation.

Conclusion

The foregoing outlines our experience at the Haile, which we believe constitutes a fair test of one type of southern Appalachian gold mining. Sufficient capital was provided for the enterprise, and capable engineers were engaged to direct the various operations involved. A half-way attempt would not have succeeded.

The authors are indebted to Daniel B. Gregg, superintendent of operations and construction, and to Edward A. Hassan, Jr., engineer in charge of exploration, for their assistance in preparing this article.

Sinking A Ventilation Bore Hole In Minnesota

● ***Unique System of Shaft Sinking by Shot Drill Successfully Applied at Zenith Iron Mine of Pickands Mather***

By B. S. RICHARDS
Superintendent, Zenith Mine
Pickands, Mather & Co.
Ely, Minn.

PICKANDS, MATHER & COMPANY, operators of iron mines in the Lake Superior region, decided in 1937 that an additional opening would greatly improve ventilation in their Zenith Mine, located at Ely, Minn., on the Vermilion Range.

When the various ways of making a satisfactory ventilation opening were examined the boring system developed by the Idaho Maryland Mines Corporation in California* seemed to offer the best solution.

This system would produce a circular opening, and since it would be put down without the use of powder, it would stand without support and would, therefore, be free from maintenance charges. Due to its shape and its smooth walls it would be relatively free from friction. It was calculated that fifty thousand cubic feet of air a minute, an ample supply for the mine, could be economically delivered through a five and a half foot diameter opening of this kind.

For those who may not be familiar with this method of boring a hole it should be explained that the work is done by a core drill, designed so the entire machine goes into the hole (See Fig. 1).

Thus, instead of conveying power down the hole through drill rods, the motor at the bottom of the hole draws power from a flexible cable, thereby increasing the depth of drilling possible.

Operating Mechanism and Routine Described

The drill motor rotates at 1,750 revolutions per minute, operating through a set of reduction gears, so that the core barrel speed is reduced to about fifty revolutions per minute. When the drill is in operation, the runner is inside of the driving unit where he can pay close attention to the various controls. These controls consist of the motor starter button, an ammeter, a weight control mechanism, and the shot feed box and mechanism. The operator judges how the drill is operating by watching the ammeter and listening to the sound made by the cutting shoe. Adjustments are made in the weight by turning a wheel, which operates through a winch to raise or lower the core barrel, and the results are noted by watching a weight indicator dial. The drilling shot is contained in a box near the operator's left hand, and the shot feed mechanism is calibrated to show how much shot will be fed to the cutting shoe each time the shot feed lever is operated. With these various controls at hand, the drill is operated with a minimum amount of guess work. Continual variations in the ground make small adjustments in drilling conditions necessary.

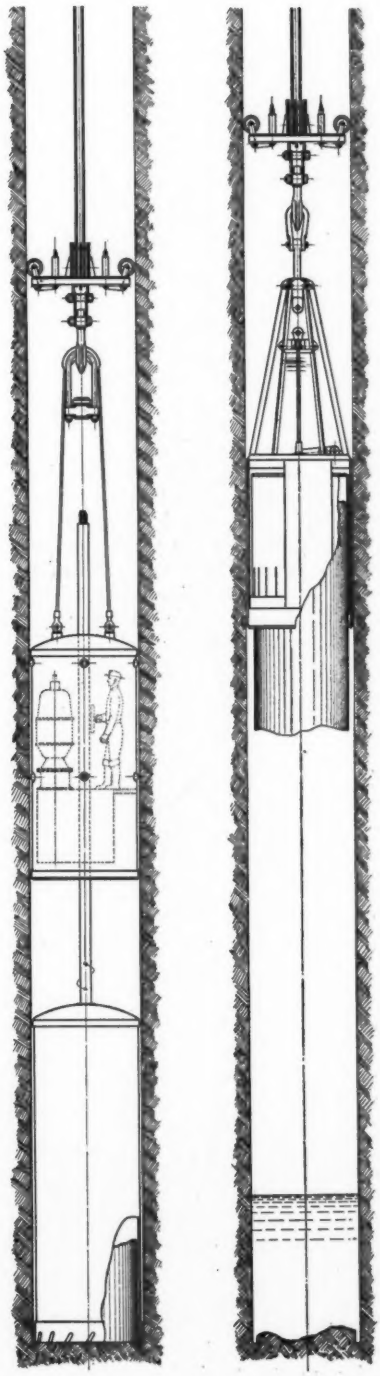


Fig. 1. Generalized section illustrating the boring core drill and the core-pulling operation used in the Zenith mine ventilation hole

* "Boring a 5-ft. Shaft 1,125 ft. deep at the Idaho Maryland Mine," by J. B. Newsom, Mining and Metallurgy, September, 1936.
U. S. Bureau of Mines Information Circular Number 6923, "Shaft Sinking with a Shot Drill, Idaho Maryland Mine, Grass Valley, California," by J. B. Newsom and C. F. Jackson.

The cutting shoe at the bottom of the core barrel is a ring of soft steel 1½ inches thick with a series of slots cut in the lower edge. The drilling shot is fed down the outside of the core barrel, and works its way to the cutting shoe, where it is caught by the slots. The slots lead to the lower edge of the shoe, and carry the shot directly under the cutting edge. The shot is made of chilled gray iron, each pellet about 3/32 of an inch in diameter. Since the chilled iron is much harder than the low carbon cutting shoe, pellets of shot become embedded in the bottom of the cutting edge as it turns, scraping and abrading the rock. Thus, as the core barrel rotates it cuts a circular slot about two inches in width around the core.

When the core has been cut to a depth of ten or more feet the drill is pulled and set aside, and the water and cuttings are removed by bailing. The core is then broken off, usually near the bottom, by driving a pair of bull wedges in the slot on one side of the core. Next a core puller (See Fig. 1) is sent down. This core puller is fitted with gripping dogs, which are narrow enough to slip down inside of the drill kerf, and so built that when the puller is lowered they will slide down, but when it is hoisted the dogs will bite into the core and hold it.

The core is pulled to the surface and set aside, after which the bottom of the hole and slot is inspected to make sure there are no loose pieces of rock. When the driller is satisfied that there is nothing that might come loose and jamb the drill during the next drilling cycle, the machine is replaced in the hole to drill out another core.

Comparison With Grass Valley Shot Drill Outfit

Experience with the system at Grass Valley demonstrated that it would successfully handle any type of ground, though in rather soft rock in California the walls would not stand without support. No appreciable amount of water had been encountered in the drilling in California, and information indicated that the Ely greenstone, through which the hole was to be bored, likewise did not contain much water. Since the Grass Valley hole had been of a different size, and experience there had developed improvements which could be incorporated into new boring equipment, it was decided to build an entire new machine. The new outfit was different from that used in California in the following respects:

The boring machine was five and a half feet in diameter instead of five feet. The core barrel was twice as heavy, and a 100 horsepower drive motor was substituted for the 40 horsepower motor used in California.

The Core Puller was patterned on the one used previously, but was made eight feet long instead of four feet.

The other underground equipment was purchased new, but the designs were not materially altered.

The work in California had been done under a six post wooden headframe, loads being swung aside by pulling on snatch blocks fixed to the various posts. A headframe was not used at Ely, but the work was done under a stiff leg derrick (Fig. 2).

Due to the severe winter conditions in northern Minnesota, insulated buildings were erected. The insulation was a double wall of corrugated iron with four inch thick rock wool bats between the outer and inner walls.

In California the loads were handled by a double drum hoist. Two hoists were used at Ely, one with a rope pull of 12,000 pounds, operating as a four part line to give a normal pull of about 48,000 pounds, for heavy loads; and the other with a rope pull of 2,600 pounds, for light loads. The hoisting equipment was not purchased for the job, but was brought in from other mines operated by Pickands, Mather & Company.

The previous work had indicated that experience and operating skill are necessary in work of this nature, so a foreman and three drill runners were brought from California.

Fast Drilling Hindered by Heavy Rains

Designing, assembling, and erecting the equipment was completed in March, and drilling started on April 1, 1938. Progress was rather slow at the start, as part of the crew were inexperienced; the work therefore carried on two 8-hour shifts a day during the training period. Advance for the month was 105 feet.

After all of the men had been trained, the work was carried on continuously, and much better progress was made in May. Progress for the month amounted to 214 feet.

The spring of 1938 was exceptionally wet in northern Minnesota, which resulted in the flow of water being much heavier than estimated. The time spent bailing gradually rose to over 40 percent, and the footage showed a corresponding decrease. By the middle of June, the flow of water had increased to such an extent that it was decided to change the method of removing water. A new bailer was constructed consisting of a tank with a pump mounted below it, the entire unit to be lowered into the bore hole. This apparatus reduced the bailing time to about 25 percent, and had the further effect of making it possible to keep the hole free from water for two hours, long enough to complete any ordinary operation at the bottom. The pump and tank were put into use about the 8th of July, and materially increased the efficiency of the operation. Advance in July totaled 240 ft. As an indication of possible future speeds by this method,

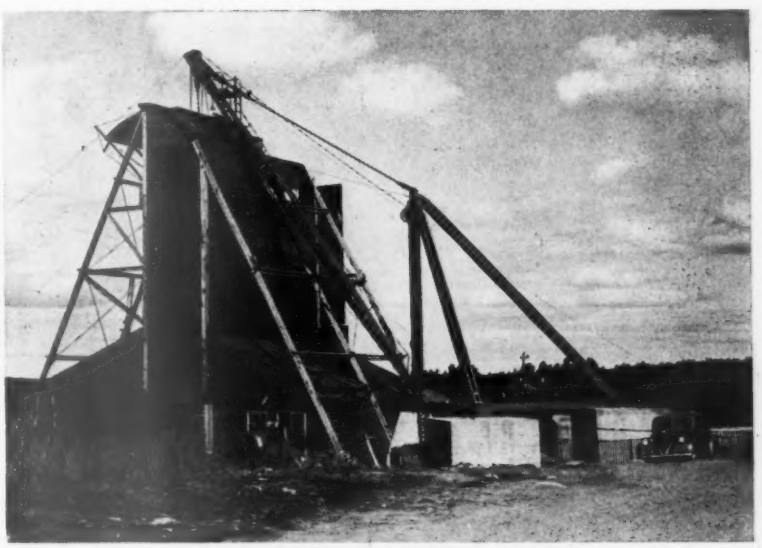


Fig. 2. Stiff leg derrick used in boring the shaft

it seems worth noting that during the last 21 days of July the bore hole was deepened 208 ft.

Summarizing, in four months of operation the hole has been deepened some 679 ft., at an average rate of about 170 ft. a month.

Since this is only the second opening of this type that has been put down, the practice is still being developed. For example—when the work was started, shot consumption averaged 60 to 70 lb. of shot to a foot of hole, but as the operators gained skill the shot consumption decreased. At present, it is running about 25 lb. a foot.

Fig. 3. Cores from bore, showing vertical and steeply pitching slips

Correct Cutting Rate on Drill Shoe a Problem

Another point that has caused much discussion is the matter of putting the correct cutting weight on the drill shoe. The boring machine is built with an indicator scale and a mechanism for taking weight off the cutting shoe, so it is possible to vary the weight as desired. As the crew has gained operating skill it has proved possible to increase the weight. The result has been faster cutting, the average rising from about four-tenths of a foot an hour to nearly 2 ft.

The rock has been relatively uniform, but cut with vertical and steeply pitching slips. It has been one of the surprises of the operation that a large percentage of these cores, which have fallen apart when set down after lifting to the surface, have been brought up successfully in a single piece. (See Fig. 3.)

Core pulling has been so successful that probably not over 20 ft. of the hole has been hand-mucked.

Slight Deviation From Vertical

At a depth of about 400 ft. the cracks turned away from vertical to a south dip of about 60 degrees. This change in dip, together with the addition of drilling weight, has caused the bore to deviate slightly from the vertical.

In California the hole deviated from vertical, and was brought back by use of a separate core barrel. This hole could be straightened in the same manner, but since it is not to be used as a hoisting shaft, the cost of the extra core barrel to straighten it does not seem justified. However, if the hole can be turned in some less expensive manner—for example, by setting the drill to one side—it will be worth doing. At present this is being tried.

Very complete records are being kept. Perhaps the best is the watt-hour record. This graph runs continually, 3 in. an hour, and records the power used at the bore hole. Since each machine draws a different amount of current, this record shows what was being done at any time. Studies of the best use of the equipment are

made from the watt-hour record.

Such work as this can not easily be stopped and started, so it is carried on continuously, 24 hours a day and 7 days a week. There are two men on each shift, a helper on the surface and a drill runner.

Special Safety Precautions

All of the hoisting equipment is equipped with Lilly controls, to prevent overwind and overspeeding. The small compressor, which delivers fresh air to the bottom of the hole through a ½-in. hose, is equipped with a carbon-monoxide detector. This mechanism will give an alarm and shut down the compressor when the carbon-monoxide content reaches .02 of 1 percent. Safety hoods are attached to the hoisting ropes, which handle the equipment, and offer protection when working in the hole. No lost-time accidents have occurred during the boring operation, and if the men are properly trained, this method of providing an opening is inherently safe.

While the work is not yet finished, it has progressed well beyond the experimental stage. The condition of the walls indicates that the hole will not require any maintenance charges, and will be fireproof. Undoubtedly, other operating problems will come up as additional work is done, but the problems of cutting the rock and of pulling the cores up in single pieces have been definitely solved, and such other problems as may be encountered will undoubtedly yield to careful analysis.

The Development of NEW USES for SILVER*

Conditions Leading to Move to Find New Commercial Uses Outlined, and Promising Developments Reviewed

By A. J. DORNBLATT
Senior Research Associate
American Silver Producers' Research Project

FOR the past several years, and particularly in recent months, the daily newspapers have carried items relative to silver. For the most part these items have dealt with the part silver plays in our national economy and our foreign policy. Despite its ancient history we are only now beginning to realize how little we know about this metal, and for various reasons considerable effort is being devoted at the present time to learning more about silver, and especially to develop new uses for this white metal. It is the purpose of this discussion to indicate something of the economic background leading to such efforts and to point out some of the promising developments, while incidentally discussing certain characteristics of silver which make it so versatile and so useful.

Underlying Ailments Sketched

Let us assume for the moment that we are all members of a medical clinic and we have a patient under examination. We may consider the silver producing group of mining companies as a patient who is alarmed about certain symptoms which his body is exhibiting. The mere fact that at least eight leading silver producing companies have joined together in a common endeavor to find a cure for their present affliction is itself evidence of some underlying ailment, serious enough to warrant this co-operation.

One evidence of a diseased state of affairs is the trend in the price of silver, which not only shows violent fluctuations in the past but also exhibits an unhealthy downward trend. It may be remarked here that not only are the silver producers concerned about this circumstance, but also, less directly perhaps, are the nations of the world, because in a complicated manner the price of silver affects their national economy and in some instances also is reflected in matters of national policy.

Figure 1 shows the average silver price during the period 1874-1937.

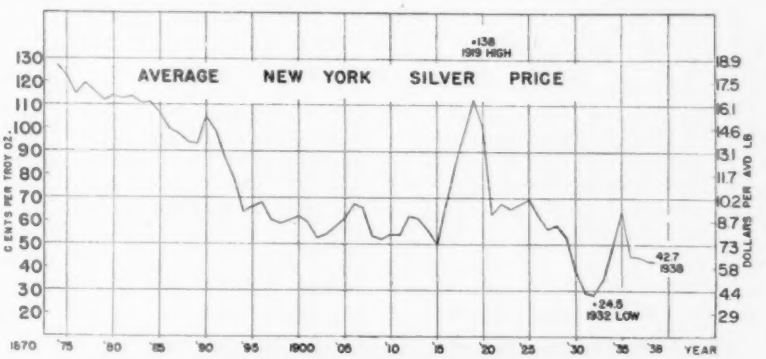


Fig. 1. Average New York price for silver, 1874-1937

* Publication approved by the Director of the National Bureau of Standards, U. S. Department of Commerce.

While it is true that many other metals have also exhibited a price curve of similar irregularity and at the present time also indicate a downward trend, that in itself is another matter; while "misery loves company," it is small consolation to those interested in silver.

Continuing our clinical study, let us next examine Figure 2, which deals with statistics of silver production and consumption. First, we note that in 1937 the world's production of silver approached 280 million troy ounces, an all-time record. For the United States and Canada the 1937 production was 95 million troy ounces. If we next consider the consumption of silver, and take only the figures for the United States and Canada because they are the most reliable and most accurately known, we find that in the same year in which the production was 95 million troy ounces only 31.5 million ounces were used by the arts and industries in the United States and Canada.

If we bear in mind the fact that by far the largest industrial consumption of silver is in these two countries we can probably safely say that at least 50 percent of the world's total consumption is thus represented. From this it is quite evident that far more silver was produced in 1937 than was consumed by the arts and industries. What was true in 1937 has been equally true for many years past. Of course, we know that in the past all silver not used industrially has been absorbed by various countries for use in coinage or monetary reserves, or—particularly in the case of China and India—absorbed by the people who treasure and hoard this white metal.

Until about eight years ago China and India annually absorbed huge quantities of silver produced from the mines of other countries. In prosperous years China took as much as 125 million ounces per year. The Indian consumption was normally not much under 100 million ounces a year. However, since about 1931 these two nations have absorbed less silver than they have released to the world's markets.

It is not our purpose to discuss at this time reasons for this very radical and very important change in trend. It is quite obvious, however, that with China and India actually releasing more silver from their hoarded supply than they are absorbing, the annual production of silver from silver ores and from the refining of copper, lead, and zinc ores containing silver, greatly exceeds that which would have been

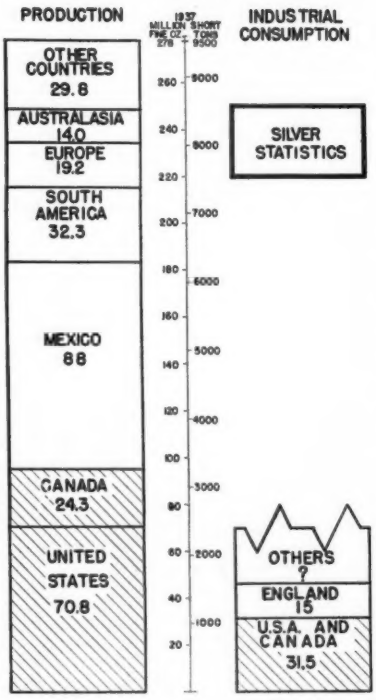


Fig. 2. World silver production and industrial consumption, 1937

absorbed in so-called normal times and channels. This brings up the question of what is happening to the surplus of silver that has been forced on the market in recent years. The Silver Purchase Act of 1934 authorized the Secretary of the Treasury to purchase silver until our silver reserve equals 25 percent of our total monetary stocks, unless the market value for silver should, in the meantime, equal its monetary value of $1.29 per troy ounce. Purchases made under this Act have now exceeded 1,200,000,000 ounces.

One other remark may be made in passing regarding the silver production figures. Considering only the United States, approximately 60 percent of the silver produced each year comes not from silver mines as such, but as a by-product of lead, zinc, and copper mining. Presumably the same figure approximates the percentage of by-product silver in the world production. That is to say, nearly 2/3 of the silver produced annually is produced because copper, lead, and zinc are being extracted from their ores, and the recovery of silver associated with these metals is incidental to the recovery of the metals just mentioned.

It follows, therefore, that silver will be forced on the market so long as demand for these other metals warrants their production. It seems, then, that the malady which has come to the attention of our "medical clinic" should be diagnosed as an overproduction of silver.

Possible Remedies Considered

Let us next consider the cure. Several alternative remedies might be considered:

One remedy would be to limit production, but this is impracticable. Silver is mined all over the world and concerted action aiming to restrict output is unlikely, and even if obtained it would be ineffective, because of the large proportion of by-product silver.

Another remedy would be to increase consumption. Let us now consider a suitable prescription which will increase silver consumption. A reasonable prescription would seem to be the development of new uses and the extension of present uses of silver through research and liaison with industry. That at least is the prescription which silver producers sponsoring the American Silver Producers' Research Project feel is most apt in the long run to effect a cure.

Characteristics of Silver

A review of the characteristics and uses of silver will be instrumental in showing why and how silver is used at present and will indicate the lines of investigation to be followed in attempting to develop new uses.

Let us consider the well-known characteristics of silver.

1. Relative scarcity. Even in 1937, the peak year, the annual production of silver was only 9,500 short tons and the accumulated hoard of silver stored up since time immemorial, estimated to be 550,000 tons, is considerably less than last year's production (2,434,000 tons) of copper.

2. Great durability. The durability of silver is, of course, connected with its chemical inertness, implied by the reference to silver as "a noble metal."

3. Aesthetic appeal. The whiteness of silver is unrivalled among all metals, and since time immemorial it has appealed to those who treasure fine things.

These three characteristics account for silver's intrinsic value and its ancient use as a medium of exchange and, later, coinage. It is, of course, the intrinsic value and workability which lead to the great use of silver in ornamentation and account for its

widespread distribution among the peoples of the earth.

4. Workability. Silver is second only to gold in its malleability and ductility. It can be hammered into leaf so thin as to be translucent. It can be drawn into wire so fine that from a piece the size of the head of a pin, as much as 400 ft. of wire can be produced. In addition, it can be readily polished to a brilliant, mirror-like surface.

The four characteristics outlined thus far account for its use in fine jewelry, ornaments and tableware.

5. Toxicological properties of the metal and its salts. The earliest medical literature refers to the use of silver and silver compounds. Apparently the ancients appreciated the healing properties of silver, using silver foil to speed the healing of open wounds, and using the nitrate (lunar caustic) for cautery. Modern medical science makes extensive use of silver in many forms. Today we say that the metal itself possesses "oligodynamic" properties, by which we mean that exceedingly minute amounts have the power of destroying bacteria.

These five characteristics of silver were appreciated by the ancients and are responsible for its traditional uses.

6. Photo-sensitive property of silver compounds. The photo-sensitivity of silver halides has been put to practical use in the photographic industry, which now consumes approximately a ton of silver each day.

7. High optical reflectivity. The high optical reflectivity of silver is used to advantage in the manufacture of mirrors, telescopes and other scientific instruments.

Principal Industrial Uses

Figure 3 indicates the distribution of the commonly known uses of silver (other than monetary) for the year 1929. The major uses are in the manufacture of sterling silverware, in the photographic industry and in the manufacture of electroplated ware. Other applications indicated are in the jewelry and optical goods trades, a minor industrial use, and some use in the form of chemicals. Photographic uses have extended rapidly since 1929 and now exceed in amount the use in sterling silverware. The industrial uses have increased to over 12 per cent of the total consumption in 1937.

Minor Applications

Let us next consider the less well-known characteristics of silver and see to what advantage they are put. Silver has the *highest electrical conductivity* of any metal. It is being increasingly used in the electrical industry, where it is extensively employed as a contact metal in switch gear. It has also the *highest thermal conductivity* of any metal, although this property is not as yet put to much practical use. Its *corrosion resistance* to acids, alkalis, fruit juices, and oxidation at high temperature are responsible for its surprisingly large use in the chemical and pharmaceutical industries and in the handling of foodstuffs. It possesses valuable *catalytic properties*, and silver catalyts have a definite place in the synthetic chemical industry. Certain silver salts are used for special purposes in the chemical industry and may be found in every chemical laboratory.

Silver forms many *useful alloys*. Almost everyone is familar with silver amalgams as used in dentistry, but we all are perhaps a little less aware of the part silver plays in alloys used in dentures, bridges, and plates. Probably the largest engineering use of silver is in the form of brazing alloys or silver

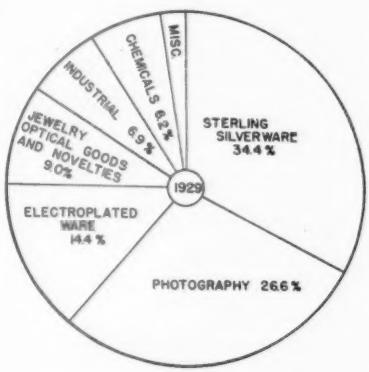


Fig. 3. Silver consumption in arts and industries in the United States. Total 1929 consumption, 28.5 million troy oz.

solders which are very extensively used for the production of strong ductile joints at temperatures lower than are possible in welding processes. Several thousand ounces are used daily in brazing electrical refrigerator assemblies and automobile steering wheel spokes. Sterling silver itself is an alloy of silver with 7½ per cent of other metal, usually copper. Silver alloys are used in automobile and aviation engine bearings, in electrical contacts, in welding rod and welding electrodes. The potential use of silver in the metallurgical field is believed to be quite large.

Silver Producers Launch Study to Find New Uses

It will be of interest to mention, briefly, steps that have already been taken by the silver producers to encourage the development of new industrial uses for silver. Eight of the leading silver-producing companies of the United States several years ago supported a survey of the possibilities in this field. Two research associates, sponsored by these companies, made the desired survey at the National Bureau of Standards, the results of which are reported in Circular C412 of the National Bureau of Standards, "Silver: Its Properties and Industrial Uses." This report, published in 1936, was followed by a decision on the part of the sponsors to support more intensive study directed toward the development of new uses for silver.

During the year 1937-1938 the sponsors supported 15 research fellowships placed at seven universities, Battelle Memorial Institute and the National Bureau of Standards. Organization of the American Silver Producers' Research Project was placed in the hands of Mr. Lawrence Addicks, and the work at the various institutions has been coordinated through the Senior Research Associate at the National Bureau of Standards.

At the present time the project is in its second year, and there are fellowships at Rensselaer Polytechnic Institute, Lehigh University, Cornell University, and Battelle Memorial Institute; in addition there are four research associates and a research clerk for the project at the National Bureau of Standards. California Institute of Technology is the recipient of an independently sponsored grant to further a research program which includes in its scope the development of new uses for silver.

Broad Scope of Research Program

While it is too early to appraise the work still in progress, some comments regarding the nature of the work to date will illustrate the very broad scope of the silver research program. (Any estimate of the contributions of research to the development of new uses for silver must, of course, take into account the foundation already laid by the extensive research which has been carried on for some years past by progressive industrial organizations; such research has already been particularly fruitful in developing the widely used silver brazing alloys, the silver aviation engine bearings, in extending the use of silver in the elec-

trical industry, and, recently, in making silver-clad steel, nickel, and copper bi-metal commercially available.)

The biological action of silver salts received attention of research fellows at the University of Pennsylvania Medical School and is still being studied at Cornell University; the efficacy of silver solutions in killing certain bacteria and fungus organisms has been demonstrated and such solutions are now undergoing trial to determine their value as fungicides and plant sprays.

The catalytic properties of silver and also its heat-transfer properties were investigated at the University of Pennsylvania; samarium-promoted silver was found to be an excellent catalyst for the oxidation of ethanol.

The electrodeposition of silver and of silver alloys received attention at the University of Indiana; nickel, cobalt, cadmium, copper, iron, zinc, and lead were codeposited with silver and a technique was developed for producing a thick, adherent plate of silver on steel.

Certain physico-chemical properties of silver and its salts have been studied at Lehigh; in particular, consideration has been given to using heated silver as a means for fractionating oxygen and nitrogen mixtures, since hot silver is permeable to oxygen but not to nitrogen.

The electrical properties of silver are being studied at Rensselaer Polytechnic Institute; because of the low contact drop obtained with silver it is being considered for slip rings, brushes, and commutators. Unlike the oxide or tarnish that forms on copper, the sulfide tarnish found on silver is electrically conducting and is readily decomposed to metallic silver by heat or direct current. The low value, plus the uniformity of the contact resistance voltage drop at silver contacting surfaces gives silver a very decided advantage over copper, and the electrical industry is rapidly increasing its use of silver in applications of this nature. Silver-plating by means of a brush process has been developed commercially, and it is now possible to carry the electro-plating equipment to the place where the plating is needed, instead of being limited to applications where the work to be plated can be taken to a plating bath.

The characteristics of silver and high-silver alloys as bearing metals have been a topic of absorbing interest under investigation at Battelle Memorial Institute; it has been indicated that pure silver or silver with a low percentage of lead will make an excellent bearing metal suitable for the most severe service.

The development of new alloys containing silver is being considered as part of a comprehensive metallurgical program, a portion of which has been carried out by research fellows at the Massachusetts Institute of Technology and at Columbia University, and is now concentrated at the National Bureau of Standards; the properties of 200 different alloys, ranging from common engineering alloys like brass and bronze with additions of not over 5 percent of silver, to silver-rich alloys, are in process of study.

Promising Indications

Several applications that may appreciably increase the use of silver for industrial purposes appear quite promising at this time. Aviation-engine bearings consisting of a layer of .020 in. of silver on a steel backing are in commercial use today and bearings of this type may find use wherever exceptionally high bearing pressures are encountered; it is possible that the present application will be extended to Diesel and heavy-duty bus and tractor engines.

A very large potential market exists for the use of silver-clad base metal such as copper, nickel and steel for use in chemical equipment construction, shipping containers for corrosives, fruit juices, pharmaceuticals, etc. In conjunction with commercial organizations a small silver-lined container has been developed which has a lining only .001 in. thick; the cost of this type of container is therefore brought within reason. While it retains all the desirable characteristics of silver in so far as resistance to acids, alkalis, and other corrosives is concerned it possesses greater strength than can be obtained in solid silver construction. Considerable work is being done to demonstrate the advantages of silver-clad metal.

In the metallurgical field promising results have been obtained by additions of silver to magnesium-base alloys, to bronze, and to iron. Undoubtedly there will be an expanding use of silver both alloyed and unalloyed for electrical uses, brazing metals and as a constructional material. The development of a commercially successful fungicide or insecticide utilizing silver salts would open up a tonnage outlet for silver.

Some Evidence of Improvement

The case history of our "patient" having been reviewed, the malady diagnosed, the cure and compounding of the prescription having been discussed, let us now state our prognosis:

The disease is not incurable, and the "patient" shows some evidence of an improved condition. However, it is likely that considerable time will be required before a complete restoration of health is effected. Although still far from the convalescent state, it is encouraging to note that some improvement is taking place, as witnessed by the fact that the consumption of silver by the arts and industries in the United States and Canada last year showed a 20 percent increase over the 1936 consumption and that the largest increase was noted in the strictly industrial uses, presumably an increased use in the electrical contact and silver brazing fields. Industrial uses increased 35 percent as compared with the same uses in 1936, while sterling silver increased in use but 25 percent, plated ware 20 percent, and photographic uses 10 percent.

Price Compares Favorably With Many Industrial Metals

In conclusion it is probably well to anticipate the inevitable question of cost as applied to silver. Popularly, silver is classed with the precious metals. Although it does fall in this category in regard to its nobility and ornamental appeal, its price on the open market today is but 42.7 cents per troy ounce or $6.25 per avoirdupois pound, whereas an avoirdupois pound of gold is worth $510, platinum $525, iridium $1,312, and rhodium $1,920!

Its relative inexpensiveness and availability tend rather to class silver with industrially useful metals such as cadmium, cobalt, tellurium, selenium, titanium, zirconium, tungsten, molybdenum, columbium, and beryllium, which range in order from about $1 per pound to $23 per pound of the commercially pure metal. Actually silver is less expensive than the widely used alloying elements tungsten, molybdenum, columbium, and beryllium. Its industrial cost may actually be quite small when due allowance is made for scrap value.

Certainly silver can be, and is being considered for uses unthought of a few years ago. Because of its unique characteristics it is rapidly establishing a place for itself among our most useful industrial metals, and planned research is playing an important part in bringing about a new concept of an ancient metal.

Attractive miners' dwellings at picturesque town of Melcroft, Pa.

CONVEYOR MINING Has Saved MELCROFT

● *An Operation of the Koppers Coal Company*

By GLENN B. SOUTHWARD
Mechanization Engineer
American Mining Congress

MELCROFT, Pennsylvania, would very probably have been a ghost town by now had it not been for conveyor mining. Certainly, the number of abandoned coal plants in the near vicinity that have been forced to close down during the past decade would seem to justify this statement, and for a time it really looked as though Melcroft was about to share the same fate. Faced with competition from other fuels and from other fields that have more favorable conditions, it became apparent about two years ago that existing hand loading methods could not produce coal against this competition, and the future of Melcroft was admittedly discouraging to the officials of the Koppers Coal Company.

After much consideration, however, it was finally decided that through the use of conveyors the coal might be mined economically; at any rate, it was conveyors or nothing, so in March 1937 a trial unit was installed. Everyone considered that this was an experiment—except W. J. B. Mayo, superintendent. He had already made up his own mind that conveyors were the answer for this operation, and subsequent results have proven that he was right, for Melcroft is now operating entirely with conveyors, and is producing about one thousand tons of coal per day.

The town of Melcroft is situated in Indian Creek Valley, Fayette County, about midway between Connellsville and Somerset, and is served by a branch of the Johnstown-Rockwood division of the B. & O. Rwy. The field was opened about twenty-five years ago, and at one time had more than twenty coal operations. Competition and declining markets, however, have forced these plants to close, one by one, until today there are only two mines running. Of these two, Melcroft is the largest producer.

W. J. B. MAYO
Superintendent

Indian Creek has picturesque scenery with rolling hills and open valleys, but it is not a farming country—at least not sufficiently productive to support the community now making a living from the coal mines. Small farms and gardens are a supplementary aid to those who are otherwise employed, but if it were not for the coal mine, the people who are now in Melcroft would simply have to move out. Conveyor mining has saved their jobs and their homes, and because conveyors have been put in operation there is today a population of nearly one thousand people in this valley at Melcroft who are comfortably self-supported in pleasant surroundings.

Good housekeeping prevails at Melcroft, as shown by the above tipple and shops

Seam Conditions

The seam is known as the Miller "B," and outcrops at tipple height. In this locality it has an average thickness of thirty-six inches of coal, overlaid with eight inches of hard bone. Above this is a slate top. The coal is of medium hard structure and presents no unusual difficulties in cutting and drilling. The seam height, however, is variable to some degree; small areas are encountered where the height will increase to as much as forty-two inches, but offsetting these are other places where the coal will go down to twenty-eight inches. Steep grades, some as high as sixteen percent, occur for short distances, and such a combination of varying heights and pitches made hand mining a difficult and expensive operation, as can be easily understood.

Top slate brushing is done on all haulage ways, but with hand mining, in order to gain sufficient height for mine car loading, it was further necessary to take down the top eight inches of bone in the rooms. This meant that almost twenty percent of the face work was non-productive. With conveyor loading the top bone in the rooms is left in place; a natural cleavage plane gives a clean separation of the coal, while the bone forms a satisfactory roof with moderate timbering. Obviously, a considerable cost saving has resulted from this change in procedure.

In addition to the difficulties imposed by natural conditions, Melcroft has a drainage situation which is rather costly. Underground water is not excessive and it would be a comparatively simple matter to keep the working places and the haulage roads dry, but the creeks in this valley are tributary to a nearby municipal reservoir, and mine water cannot be discharged into these streams. It has therefore been necessary to construct a system of pumps, surface flumes and drainage tunnels so as to carry all mine water for a distance of six miles to a discharge point below the restricted area. The expense of pumping and maintenance of the drainage system, together with carrying charges on the construction investment, all go into the operating cost of the mine, and this extra cost incidentally amounts to several cents per ton.

Partially offsetting these difficulties, the seam at Melcroft is of high quality and does not present a serious cleaning problem for market preparation. The coal under the bone is fairly free from impurities, and the few streaks that do exist can be removed by hand picking at the tipple. Practically no slate removal is done underground by the conveyor crews, although care of course is exercised to see that proper face preparation methods are followed.

Mining Equipment

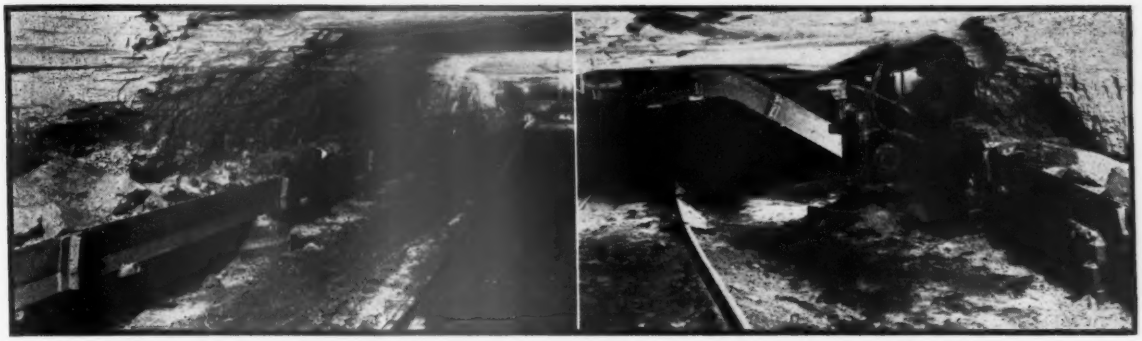
Conveyors were installed at Melcroft to replace hand loading which was proving uneconomical, and in view of the fact that this was a replacement and not a new mine, the equipment that was already on hand for hauling, cutting, etc., was continued in use. No additional coal cleaning problems have resulted from the conveyor operation, and the tipple facilities which were adequate for market preparation with hand loading have remained unchanged. These consist of a crossover dump, shaking screens, picking tables and hoists for layer-loading the railroad cars. Consequently the only investment made for the conveyor installations was in the purchase of the actual conveyor units and such accessories as blower fans with tubing, electric drills and rope hoists for moving the mine cars. Recently, however, an underground repair shop was constructed and is now ready to be put in service; this is located close to the live workings, and will eliminate tramming the machines to the outside shop.

The entries are rock dusted, and electric cap lamps are used by all men underground. Permissible motors have not been found necessary, and blowers with tubing provide adequate ventilation at the working faces. The main haulageway is laid with 85-lb. rail on the outside and 60-lb. rail underground, all on oak ties, while the butt entries have 30-lb. rail. The Koppers Coal Company believes that "good housekeeping pays," and as a consequence the haulage roads are kept clean of slate and refuse, and are in excellent condition.

The voltage is 250 DC; the trolley lines are 4/0 with feeders supported on the trolley hangers and connected to the trolley at frequent intervals. Particular mention should be made of the manner in which cables are installed in the conveyor sections for the conveyor motors, cutting machines, etc. The rule of neatness and order which is a strict requirement at all Koppers operations is carried out by supporting the conveyor power cables on roof hangers instead of laying them in a haphazard manner along the bottom. Fuses and other protective devices prevent accidents and fires that might result from short circuits and overloads.

Conveyor Mining Systems

Hand loading into mine cars has been discontinued, and the entry development, room advancement and



Underground gathering conveyor, with room conveyors in background

Gathering conveyor discharging onto elevator at car loading point

pillar recovery are now all done by conveyor mining with hand shoveling. The room and pillar system is used; rock brushing is done on the main haulages and butt entries, but no top is taken down in the rooms or airways. The conveyors are the Jeffrey chain type, with an elevating conveyor at the car loading station.

Several widths of rooms and pillars have been tried, but the system now used is shown in the accompanying sketch. The first installation worked the rooms off only one side of the entry, but in order to reduce the cost of rock brushing, the double room system has now been adopted as shown on the sketch and the accompanying mine map. The rooms are driven 30 ft. wide for a length of 300 ft., and are turned on 80-ft. centers leaving a 50-ft. pillar between. As will be noted on the sketch, a blind cross cut is driven through this pillar as the room advances, and the adjoining room later cuts into this.

When the room has been driven to its full length, the pillar is recovered immediately. This is usually worked open-end, which has proved generally successful, although the method for the recovery varies to some degree with roof conditions. At times an entire pillar has been taken out without interruption from roof falls, while at other times a cave has occurred during the removal. In such cases a new end is opened across the pillar, leaving a thin stump or fender for protection against the roof weight.

The rooms to the right and left are worked simultaneously and scheduled to advance at approximately the same rate. After both room pillars have been drawn out down to the entry, the chain pillar block behind them is then recovered—either by open-ending or by splitting.

Conveyor Operation

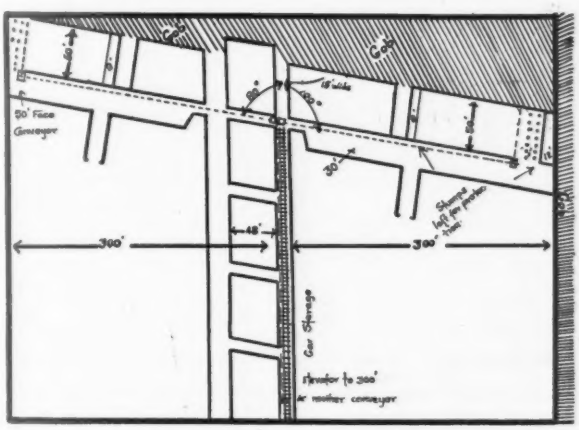
All the conveyors are worked on double shift, and the usual shift crew for a two-room unit consists of 12 men, including the leader and the man at the loading boom. The contract tonnage rate as provided in the scale agreement for this field, is paid on one check number for both rooms on one shift, and is divided between the members of the crew of that shift. As these men all work in the same unit it is possible to transfer certain of them from one room to another, as the work may require, and in this way the two rooms advance and retreat fairly well together.

A two-room unit has two low type face conveyors, two-room conveyors both of which discharge onto one gathering conveyor that is laid down the haulage entry parallel to the mine car track. This gathering conveyor loads onto an elevator which raises the coal into the mine cars. These cars are of 2¼-ton capacity, and are placed in trips by an electric locomotive. A Brown-Fayro rope hoist is used to move the cars at the loading point.

In the development, a pair of butt entries is worked as a unit, but only one heading is advanced at a time. The haulageway is first driven to the conveyor limit of 300 ft., and when this point is reached the conveyor is transferred into the adjoining aircourse, using a short cross conveyor through a breakthrough to the loading elevator. While the aircourse is driving, the rock brushing and track work are done on the haulageway.

As will be noted on the accompanying mine map, Fourth Right headings are being driven with a single conveyor unit as just described, while a set of four main headings are advancing at the top of Third Right. These are being worked with two conveyors, both discharging on to a main gathering conveyor which leads back to the boom at the loading point as indicated.

The map shows the mining that has been done by conveyors since the first installation was made in March 1937—a period of approximately eighteen months. The shaded portion of the rooms and pillars off Nos. 1 and 2 Right Headings has been mined en-



Sketch showing plan of room mining at Melcroft

tirely with conveyors, but a portion of the entry development shown in this area was done with hand loading prior to the time the conveyors were installed. Other conveyors have been added to the first trial installation of one unit, and there are at present three units which are working six faces—a two-room unit in room and pillar, a single unit driving a pair of butt headings, and a double unit driving the four main headings. This equipment operating double shift is producing about 1,000 tons per day.

Safety and Welfare

Safety and accident prevention are considered of first importance at all Koppers plants, and Melcroft is no exception in this respect. All employes are given first-aid training, and the Melcroft First Aid Team won first prize at the Tri-County Safety Day and First Aid Meet held in Uniontown on August 20, 1938. In this competition teams were entered from three counties in the central Pennsylvania field — Fayette, Westmoreland and Somerset.

The general appearance of the miners' dwellings is above the average. There is sufficient ground around each house for flowers and gardens, and prizes offered by the company for the most attractive yard and the best garden have done much to improve and beautify the surroundings. This naturally tends to attract and keep the better type of workmen, and Melcroft has been able to select a very desirable class of employes. Of course it goes without saying that men are not influenced to come and stay at this mine solely through the appearance of the town. Adequate earnings made possible by conveyors is the real reason for their desire to work and live there.

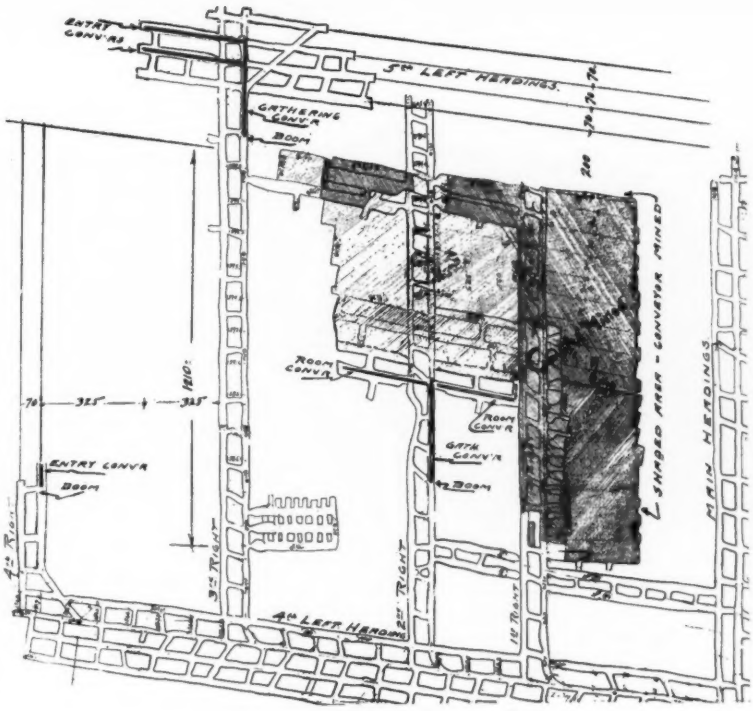
The following editorial which appeared in the *Connellsville* (Pa.) *Daily Courier* on August 18, 1938, is a rather definite indication of how Melcroft is regarded by the general public in this section of the state:

"When it comes to scenic beauty of surroundings the plant of the Melcroft Coal Company—a Koppers affiliate—at Melcroft, in the Indian Creek Valley, probably takes first place in the Connellsville region. Situated between wooded hills and among green fields the small, but cozy homes of the employes are among the most attractive to be found in the mining areas.

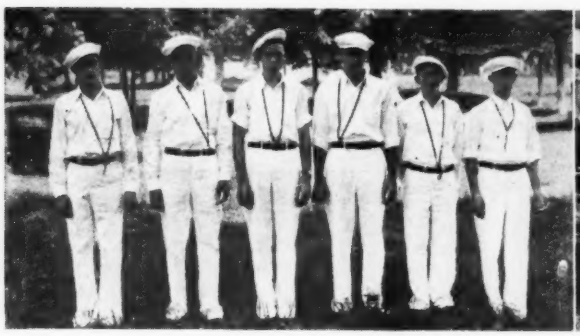
"The coal plant is recognized as among the most modern. The underground workings are almost fully mechanized. The plant as a whole rates among the best in Pennsylvania.

"Something else on which Melcroft prides itself is its freedom from accidents. During five of the seven months of the current year the employes came through without a single lost-time accident. This speaks volumes, for the operation of thin-vein mines is considered more hazardous than the thick, with which Connellsville folks are more familiar.

"Safety is kept constantly before employes, and their families, too, by means of periodical rallies to which all, young and old, are invited, and which they attend almost without exception."



Mine map showing conveyor workings



Melcroft First Aid team which won first place at Tri-County Safety Day

The Melcroft baseball team is well up in the first division of the Fay-West League

Surface plants are now active at the No. 4 shaft of the Isle Royale mine

REOPENING and REHABILITATING The ISLE ROYALE COPPER MINE

● *Difficulties of Putting an Old Mine Back on its Feet After Five Years' Shut-Down Cited in Detail*

By LUCIEN EATON
General Manager
Isle Royale Copper Co.

EARLY in April, 1937, the stockholders of the Isle Royale Copper Company voted to reopen their mine at Houghton, Mich., after a shutdown of five years.

The Isle Royale mine is an old property, the first work having been done on it in 1855. The original company was formed to hunt for copper on Isle Royale, in Lake Superior, and when their explorations on the island proved unsuccessful they purchased land immediately south of Houghton, Mich., where the first amygdaloid lode in the district was opened and mined. Through various consolidations and reinvestment of earnings, holdings were increased to 2,783 acres, covering the outcrop of the lode for more than 3 miles.

The geological formation is a series of basic lava flows of Keweenawan age, dipping northwest at 51° to 56°. The Isle Royale lode is one of these beds, in which amygdules and fracture planes contain metallic copper. The copper is irregularly distributed in the lode, but the best ore is usually found near the footwall, and in the richer spots it extends into both foot and hanging. In the early days the whole lode was mined and averaged 13 to 14 lb. per ton; but in later years the yield was increased by selective mining to nearly 23 lb. per ton.

Earlier Development Briefed

The mine was opened by seven inclined shafts sunk in or just under the lode, numbered successively from north to south. The greatest depth was reached near the middle of the deposit, where No. 4 shaft reached a depth of 4,776 ft. on the incline, a vertical depth of approximately 4,000 ft. The depth of No. 5 shaft is 250 ft. less, and the others are all shallower. The lode has been opened for 15,000 ft. along the strike, and the workings are almost continuous. The level interval is 125 ft. on the lode, or approximately 100 ft. vertically. In No. 4 shaft the bottom level is the 37th and in No. 5 shaft it is the 35th.

The ore is mined by shrinkage stoping above stulls. A shaft pillar 200 ft. wide was left at each shaft, and a horizontal pillar was left for the length of the mine between the 16th and 17th levels. These pillars divide the plane of the lode into panels approximately 2,000 ft. square, and have apparently formed a substantial support for the hanging wall. Prior to the shutdown both stopes and drifts in most of the mine stood open without the use of much timber, and since a retreating system was used in stoping, little trouble was experienced with heavy ground; the stopes usually did not cave until after the ore had been removed.

No. 1 shaft was worked out years ago, and much of the equipment was sold as scrap. No. 3 shaft is also entirely finished, and No. 6 and No. 7 shafts are unfit for service. There has been a good plant at No. 6 shaft, but the shaft itself is in poor condition, and some of the equipment has been taken away. No. 7 shaft never went beyond the exploration stage, and is not equipped for production.

Operations Resumed at Nos. 4 and 5 Shafts

Just before the mine was closed, No. 2, No. 4, and No. 5 shafts were producing, most of the output coming from No. 4 and No. 5. During the shutdown the plant at No. 2 shaft deteriorated badly, and although the shaft itself is in good condition, so few working places are available that it seemed best to leave this shaft idle, and to concentrate operations at No. 4 and No. 5 shafts, where the bulk of the ore reserves are situated. A large amount of development was done in later years on the lower levels of these shafts, and ore for several years' output was developed. The plants at both shafts were not in bad condition, and the shafts themselves had been in good working condition at the time the mine closed.

Conditions at Surface Plants

At No. 4 shaft the surface plant consists of a boiler house with 6 locomotive boilers, a steel stack, a coal dock, an engine house containing a large steam hoist and 2 large air compressors, a dry or change-house for 200 men, a rockhouse or combined headframe and crusher building, and a shafthouse at the collar of the shaft. The dry and engine house are built of concrete blocks. The other buildings have steel frames and are covered with corrugated sheets. The roofs of all the buildings, except the rockhouse and shafthouse, had decayed during the five years of idleness, and needed not only new roofing but new planking as well. The coal dock had also decayed, except where it was under cover, and the pulley stands for the hoisting ropes were badly weathered on top. The boilers had rusted tubes, which had to be renewed, and the plates were pitted about the firebox doors and had to be built up by welding. All the blowoff pipes and feedwater pipes were rusted out, and the feed-water heater was a complete wreck. In the engine house the hoist was in good condition, except the throttle valve, and the air compressors were also in good shape, except the intercoolers, which leaked badly. Except for the roof and the lighting system and some pipes that had been broken by frost, the dryhouse came through the five years with little damage. The rockhouse, shafthouse, skips and cages suffered least.

The plant at No. 5 shaft consists of a steel coal dock, concrete boiler house, stack, engine house and dry, a wooden rockhouse and shafthouse, and a tankhouse for water. The steel and concrete buildings suffered little, except roofs and windows, and repairs were somewhat less than at No. 4 shaft; but the shafthouse itself and the skiproad leading from the collar of the shaft to the rockhouse were in bad shape, their decay probably being hastened by the moist air from underground, for this is an upcast shaft. The water tanks are wooden, and had to have new hoops before they could be used.

When the mine was closed, all portable underground equipment, such as drills and drill steel, cars, locomotives, motor-generator sets and switchboards, pumps and motors, fans, telephones, ringer boxes, air cylinders, transformers, etc., were removed and stored on surface; but pipes, rails, and electric wires were left in place.

Mine Cars and Locomotives Needed Considerable Repair

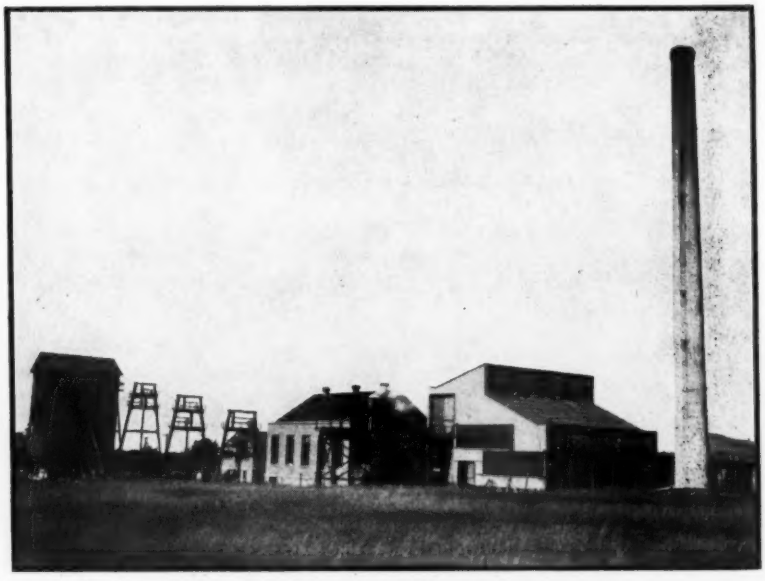
The mine cars had been left outdoors, and all the joints, such as the hinges and door catches, were rusted tight, and the plates were badly pitted; but the axles and housings, which were covered with grease, suffered little injury, even when they had been exposed to the weather for five years. The 12 storage-battery locomotives were stored in the change-houses, but their mechanical parts, except those protected by grease, were almost as badly corroded as the cars outside. The electrical parts, except the batteries, showed less deterioration, and needed little more than cleaning, drying, and varnishing. The batteries were both Exide and Edison. Some of the Exide batteries had been used and taken care of during the idle period, but the Edison batteries had received no attention. Mortality in both types was high, and seven new batteries had to be purchased. All of the charging equipment showed more deterioration than would be expected, but not so much that it could not be put back in service after being overhauled.

All electrical equipment suffered some deterioration, especially in insulation, and all motors had to be cleaned, dried, and varnished before they could be used. Much of the wiring had to be renewed, especially that which was exposed to the weather, and most contacts had to be ground.

The water in the mine, although it is alkaline and not acid, is highly corrosive to iron, and attacks copper and brass to some extent. Corrosion continues after the water has dried up, apparently because the corrosive salts are more concentrated.

Other Buildings Provided Locations for Shops

The main shops and warehouse and the office and dispensary were near No. 2 shaft, and were heated by the boiler plant there, and when it was decided not to reopen that plant, it became necessary either to provide a new heating plant and a small air compressor or to move the shops and office nearer to the center of operations. At No. 5 shaft there was a vacant boarding house and rooming house in good condition, and this was converted into a dispensary and an office and ware-



Surface plant at the No. 5 shaft, now being operated

house. The ground floors of the change-houses at No. 4 and No. 5 shafts were storage rooms, and some of these rooms were converted into shops. At No. 4 shaft is the electricians' shop and storeroom, and at No. 5 shaft is a small machine shop and a shop for drills and drill steel. The blacksmith and carpenter shops have not been moved yet.

Detachable Bits Now Used

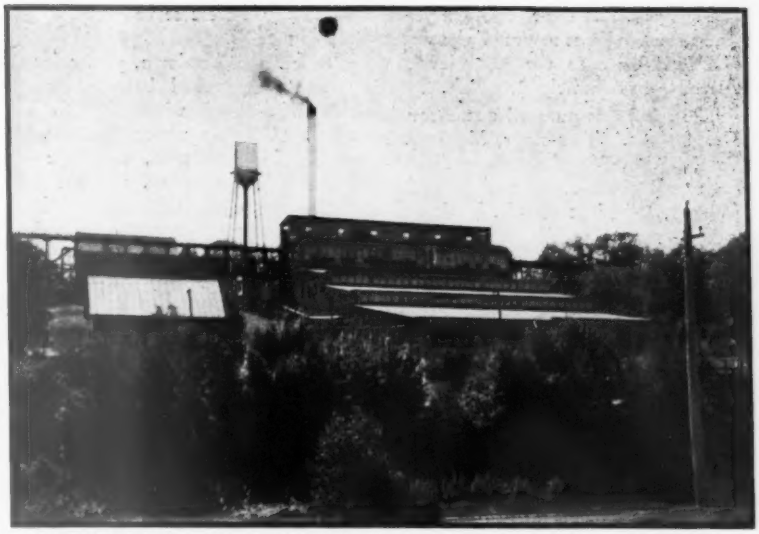
Although nearly half of the rock drills had been sold, there were enough left to start with, but some of them needed complete overhaul. Columns and arms, saddle clamps, tools and wrenches, when cleaned, oiled, and refurbished, were in condition for effective use, and many of the air hoses came through fairly well. The water hoses, however, nearly all failed, and had to be replaced, and all the hose fittings were corroded. As the drill-sharpening equipment was in poor condition and much of it was out of date, it was decided to scrap it all, and to equip the mine throughout with detachable bits. Accordingly one of the rooms under the dry at No. 5 shaft was equipped as a drill shop, and here have been installed grinders for dressing bits, a rod machine for cutting threads on rods, a grinder for shanks, and an electric furnace for annealing and hardening both rods and bits.

Five tons of new steel were purchased and made up into rods, and 10,000 bits were ordered. The rods are made of 1-in. hexagon hollow steel without lugs, and are threaded and hardened at one end and chamfered, squared, reamed out and hardened at the other. The bits are furnished by the Ingersoll-Rand Company, and were designed especially for this district according to specifications drawn up as the result of extensive tests. The bits are furnished 1⅝ in. in diameter, and have a side hole as well as a center hole.

Except for the railroad, the only means of transportation on surface was a 2-ton truck, which was ample for general service work in the summer, but would be inadequate in the heavy snows of winter. Accordingly a caterpillar-22 tractor with a bulldozer attached was purchased, and this kept the roads open in the winter, did a lot of grading and excavating, and took care of all the heavy hauling about the plant.

Rehabilitation of the Mill

The mill is on the shore of Portage Lake. It has three Nordberg steam stamps each capable of crushing 700 tons of rock per day. The stamps are followed by rolls, and the coarse copper is taken out by jigs, followed by regrinding in a ball mill, and flotation. Tailings are carried to the lake in a large wooden launder lined with steel plates. The mill uses a large amount of water, which is supplied through a 30-in. iron pipe by a centrifugal pump on the shore east of the tailings dump.



The Isle Royale mill required considerable work before operations were resumed

All of the mill equipment had been in good condition when the mine closed, and most of it, except the pipe line and launder, was under cover. During the shutdown, however, the roof of the mill went to pieces and leaked badly, and some of the machinery suffered in consequence. The steel stack rusted, and part of it fell, and it had to be replaced. Renewing the mill roof was one of the largest items, and the roofs of the boiler house and shops had to be recovered also. In the mill all the screens and most of the belts were renewed, and all the electric motors had to be cleaned and dried. Corrosion was heavy in the circulating pumps and flotation machines. The steam stamps were cleaned out, and worn shoes, dies, and one cracked stem were renewed.

The tailings launder had a few bad sections which had to be rebuilt, and there were a number of broken bents in the trestle supporting it; but on the whole it suffered less than would be expected. The 30-in. water pipe, however, being empty, had been subject to continual contraction and expansion, which threw it out of line and broke several flanges. There was some corrosion in the bottom also.

Surface Transportation

The company operates its own standard-gauge railroad over which the rock is hauled from the mine to the mill, a distance of about 5 miles. There is a connection with the Duluth, South Shore & Atlantic Railroad at Pilgrim, a short distance below the mill. A little over 6 miles of track is in use.

At the start of operations there was a washout on the line below the mill, and most of the ties were rotten. The washout was filled, and by putting in new ties on curves it was possible to run slowly over the track and to bring in coal and bulk supplies. Little else was done to the track in 1937, and enough coal was stored at the shafts to last through the winter, so that the track would not have to be kept open.

The roundhouse was in good condition, and the three 50-ton locomotives needed only minor repairs and the replacement of a few tubes to be fit for operation. The cars, however, were outside, where they were exposed to the weather, and from many of them the brasses had been stolen.

The track was thoroughly repaired in the summer of 1938, and over 9,000 ties were put in, new crossing planks were laid, and crossing signs were repainted and erected.

Set-up for Dewatering Mine

The largest item on the reopening program was getting the accumulated water out of the mine. Although the mine is a large one, the flow of water into it is relatively small, averaging only 200 g.p.m., and the workings

filled slowly. At the end of five years, when pumping was resumed, the water had risen only to the 17th level, a rise of approximately 2,000 ft.

The mine was pumped out through No. 4 shaft. Two-stage, high-speed, Cameron centrifugal pumps with 125-hp. motors, each capable of delivering 600 g.p.m. against 600-ft. head, were used as main station pumps; and single-stage Cameron motor pumps, connected in series up to 300-ft. lift, delivered to the larger pumps. Dams to provide storage were built on the levels, and the larger pumps were set up at these points. Three of the large station pumps were set up on the 5th level, three on the 11th, and three on the 17th level, providing a maximum capacity of 1,800 g.p.m. When the water had been lowered sufficiently, three more were set up on the 23rd level. When the 29th level was reached, two pumps, one taken from the 23rd and one from the 17th level, were set up there. This reduced the delivery to 1,200 g.p.m., but did not reduce the rate at which the water was lowered, because the volume to be removed was so much less on the lower levels.

Three of the single-stage motor pumps were mounted on a carriage, or "float," as it was called, which traveled on the rails in the north skip-road, and these discharged directly at first to the dam on the 17th level, where the big pumps were set up. When the next level was uncovered, two motor pumps were set up on the plat, and two of the pumps on the float were connected to them in series. This was repeated for another level, but on the third level a dam was built, and another set of pumps was erected there, the three sets of pumps running in series like a three-stage pump, and the pumps on the float discharged to the dam. The process was repeated for three more levels, and then the two series of single-stage pumps were replaced by one set of two-stage pumps, and were used again on lower levels.

The water column was 12-in. standard pipe, protected inside and out by an asphaltic cover and fitted with Victaulic joints. It was laid in the north skip-road, and that part above the level was placed at the rate of 200 to 300 ft. per shift.

Three - phase 60 - cycle alternating current for the pumps was carried down the shaft in armored, submarine-type cables at 2,200 volts, and was transformed underground for the small pumps to 440 volts. The pumps on the float were served by a flexible trailing cable.

Before the shutdown, power for the station pumps had been carried by rubber-insulated wires laid in iron pipes. On the upper levels, where black pipe was used, the pipe was nearly all eaten away, and the wires could not be used; but on the lower levels, where the pipe was galvanized, most of the old wiring, after it had been dried out by blowing air through the pipes, was found to be serviceable, even after it had been submerged for several years.

Old Station Pumps Utilized

The old station pumps are plunger pumps of small capacity against high head. They are vertical triplex or horizontal duplex, and are driven by squirrel-cage induction motors. As soon as hoisting equipment could be provided and power lines were ready, these station pumps were put back on their old foundations in the accessible pumphouses above water level. In fact, some of them were sent down with a small portable hoist operated by steam from a locomotive. In No. 4 shaft new cable was necessary above the 17th level, but in No. 2 and No. 5 shafts the old lines were salvaged. There are two pumps running in series in No. 2 shaft and four each in No. 4 and No. 5 shafts. In addition there are pumps on the first level in both No. 4 and No. 5 shafts, throwing water from the ledge to surface for general water supply.

Unwatering started on August 13, 1937, and the 35th level was reached on June 1, 1938, a period of 9½ months, during which approximately 600,000,000 gallons of water, weighing some 2,250,000 tons, were removed from the mine with an average lift of 2,500 ft.

Condition of Shafts

No. 4 shaft has two skip-roads and a ladderway, and used to be downcast. For about 1,000 ft. the ladders and sollars were in rather poor condition, and occasional props had to be put in, but below the 8th level repairs were light, with the exception of a few places. Nails and bolts were badly corroded, and much of the piping was nearly destroyed. Almost all of the water pipes for the drills and over 1,000 ft. of 7-in. air pipe had to be renewed.

No. 5 shaft is similar to No. 4 shaft, but is upcast, and much of the timber in the upper part was hemlock. When work was started, the ladders had fallen away in most places, and the timber was down just below the third level. In making repairs the south skip-road was used for hoisting. An old skip, from which part of the back had been cut to facilitate loading, was used for hoisting rock and timber; this proved to be a very handy piece of equipment.

Retimbering Operations

These shafts are not timbered with standard shaft sets. Hanging-wall plates are supported in hitches or on iron brackets set in drillholes at the end of the shaft, and dividers extend from the footwall to the hanging-wall plates. As the footwall is irregular, crossties, supported by short posts, are placed on the upper side of the dividers, and on them the stringers for the track are laid. Sets are placed on 6-ft. to 7-ft. centers, and are lagged with flattened cedar poles.

Down to a point half-way between the 4th and 5th levels most of the timber was in place, and dividers, studdles and even wall plates and lagging could be replaced by new timber without disturbing the ground. Below this point, however, as far as the 10th level, all of the timber except the skip-stringers was out, and the rock in the back of the shaft had fallen, leaving an arch 5 to 10 ft. high above the line of the old wall plates. In retimbering this section, when a wall plate had been set in place, long timbers were extended over it and were blocked against the ground and lagged. This protected the men while they were cleaning out for the next set. As soon as this set was placed, the long timbers were caught up on a pony set above the wall plate. The ground was disturbed as little as possible. At the plats the greatest amount of rock had fallen, and in some places the vertical height from the back of the arch to the foot of the shaft was over 40 ft. Some of the plats as retimbered are five sets high.

From the 10th to the 23rd level about half of the timber was down, and the rest was standing. Usually the plat timbers apparently had broken down first, and jammed in the shaft below. Then the back came down, and brought with it six or seven sets above the plat. If big pieces of rock broke through, they knocked out the sets below the level, and the hole was much larger.

Work was started in this shaft in June, 1937, and the timbering was not completed until July, 1938. Another month was required to put the tracks

in shape. New rails were laid for nearly 1,000 ft., and the stringers were trued up and blocked.

Much credit is due to Capt. William Skewes and his foremen for the excellence of their work in this shaft and for their care and skill, which permitted the job to be completed without a serious accident.

When the mine closed, the highest active stopes in both No. 4 and No. 5 shafts were on the 25th level. It was expected and planned to reopen the stopes on the 25th, 26th and 27th levels in No. 5 shaft while the water was being pumped out of the lower levels through No. 4 shaft. The poor condition of No. 5 shaft, however, upset these plans, and the first stoping was done in No. 4 shaft after the water level had been lowered to the 35th level and the unwatering pumps and water column had been removed.

Above: Chutes from shrinkage stope to tramming level

Right: Drilling a round in stope on the 32nd level. Note rack of detachable bits at right

Condition of Drifts and Stopes

When work was started in the old drifts and stopes, the walls and floors were covered with mud and slime, and every piece of iron was covered with a festoon of rust. The rails had increased to twice their normal size, but, when cleaned, were fit for use. All the pipe that was not galvanized was partly or wholly converted into iron oxide, the ¾-in. water pipes being usually entirely rusted out. On the lower levels, where galvanized pipe was used, the damage was not nearly as severe as it was higher up. Nearly all the nails were rusted off, and such things as were nailed were ready to fall apart or had already done so.

In the drifts and cut-out stopes even more than in the shrinkage stopes much rock had fallen from the back, and the greater part of it was barren, because it came from the hanging wall instead of the vein. Much more rock was ready to fall, and had to be barred down before it was safe to start work. In some places 5 or 6 ft. of ground fell or was taken down from the back. All of this had to be cleaned up before stoping could start. Only one of the shrinkage stopes in No. 4 shaft collapsed. On the 25th level the hanging came down in one stope in great slabs, blocking that part of the stope, but in the other stopes in this shaft it has been possible to resume mining at about the point where it was stopped.

In No. 5 shaft, however, where the vein is wider and the ground is not so strong, the upper stopes are pretty well blocked with fallen ground, and it has been necessary to open new stopes nearer the shaft, until sufficient rock has been drawn from the old stopes to make entry possible. Below the 28th level the stopes have stood up much better than above, and it has been possible to resume stoping where it was left off.

The unwatering and the rehabilitation of the mill were completed under the supervision of Mr. A. G. Andrew, Jr., superintendent. Mr. James H. Richards had charge of all machinery at the mine; Mr. E. A. Medlyn looked after the surface and office; Capt. William Skewes was in charge of all underground work; and Mr. Charles Vollmer had charge of the railroad. To their hard work and cooperation the successful completion of the undertaking is largely due.

Barring down loose ground on the 28th level

Clearing out fallen ground in drift

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McKinlay Entry Driving Machines at NEW ORIENT Mine

● ***Experience Over Eleven-Year Period Has Proved Numerous Outstanding Advantages in Their Use***

By F. EARLE SNARR
Chief Engineer
Chicago, Wilmington & Franklin Coal Co.

THE New Orient Mine of the Chicago, Wilmington & Franklin Coal Company, is located at West Frankfort, Franklin County, Ill. The seam worked is Illinois No. 6, which in this particular area has an average thickness of 9 ft. Construction was completed and the mine placed in regular production in 1924.

From the time the shafts were down until production was started, entry development progressed on a triple shift basis. By the end of 1924, daily production had reached 5,800 tons and entry development was placed on a double shift basis. As new territory was opened up the tonnage gradually increased to 9,800 at the close of 1925, and 11,400 tons by the end of 1926.

The mine and surface plant were designed to produce and prepare 13,500 tons of hand loaded coal per eight-hour day. It became apparent that workings to produce this tonnage would of necessity cover a tremendous area if the expensive and slow conventional methods of entry driving were depended upon to keep entries projected ahead of the working sections. Since a mechanization program was already under way, it was realized that the rate of entry advance would have to be faster with the use of loading machines than under hand loading methods.

The mining law in Illinois requires that all men except the shot-firers be removed from the mine when coal is being shot. Labor agreements permitted the multiple shifting of development entries only by special agreement and for temporary periods. The rate of entry advance was therefore under normal conditions restricted to one cut of about 7 ft. per 24 hours. Because of this restriction, main and cross entries had to be driven at a faster rate if economies from the concentration of workings and opening of new producing territories were to be realized. In an effort to gain these advantages the company purchased two McKinlay entry driving machines. They were placed in operation late in 1927, and have since been in continuous use driving entry on the night shift.

Machines Described

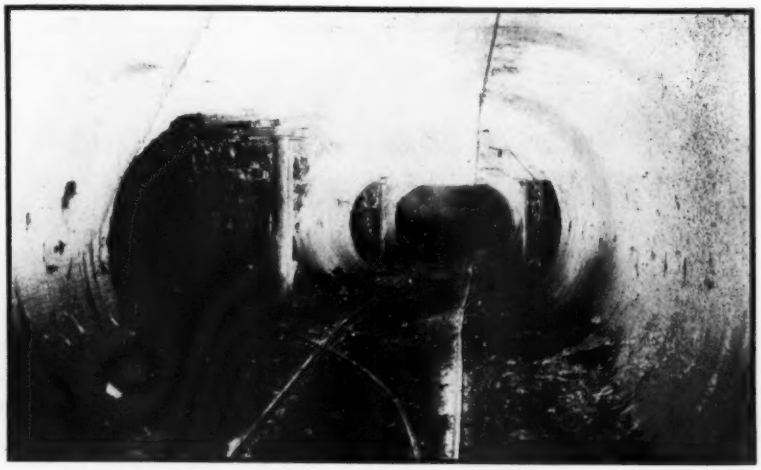
These machines have a head equipped with two rotor bars which overlap some 26 in. at the center of the entry. These bars are 86 in. long and revolving about a fixed center cut on an outside radius of 3 ft. 7 in. They are driven by a 100 hp. 460 r.p.m. motor through bevel and worm gears. At the center of the bar is a pilot bit and on either side are cutter fins 1-ft. long which cut concentric kerfs. These fins are followed by bevel rollers which break out the coal between the kerfs.

The triangular sections of coal left at the top and bottom, where the rotor arms do not overlap, are removed by cutting chains on wedging cutter bars. The cutting chain is driven by the same motor that drives the rotor arms.

The coal is carried to the center of the entry by buckets on the end of the rotors onto a conveyor which deposits it in the mine car at the rear of the machine. The original buckets furnished on the machine have been redesigned to give less breakage of the coal and at the same time reduce power required to drive them. This coal conveyor is driven by a 15-hp. motor.

Hydraulic Pressure Forces Machine Into Face

The machine is forced into the face of coal by hydraulic pressure. A pump driven by a 5-hp. motor supplies pressure to the main jack which



Panel entry developed by McKinlay machines. Height is 7'2", and extreme width 12'2"

is anchored by arms hitched into the ribs. An adjusting jack is placed over each of the four rollers on which the machine moves. These have individual control so that the machine can be leveled to follow the pitch of the coal as required. They are powered by the same hydraulic pump serving the tramming jack. The pump can be adjusted to furnish pressure up to 3,000 lbs. per square inch, which would drive the machine at a rate of 5 in. per minute. This pressure is controlled to match the type of cutting encountered and is normally set to kick off at about 2,400 lbs. The driving rate averages about 3½ in. per minute.

The cutter-arm bits are made of high speed tool steel, while the regular cutting machine bits are used in the top and bottom cutter chain. The cutter-arm bit holders or fins have been redesigned and strengthened since the machines were purchased, and an inner guide was installed on the cutting chain bar to prevent leaving the chain at the face when the machines are backed off. The cutter chain drive sprocket was changed to a renewable rim type which eliminates the necessity of dismantling the machine to renew sprockets.

Blowers and Tubing Permitted Longer Crosscut Spacing

Entries are driven in pairs and crosscuts are turned on 110-ft. centers instead of the usual spacing of 60 ft. This was made possible by the use of blowers and tubing. A standby blower unit is provided so that ventilation can be maintained at all times. The fan has a 16-in. outlet which is split to two lines of 12-in. tubing. The blowers are moved up so that the tubing is never extended more than 250 ft. from the blower. To overcome any danger of recirculation the blower fan is placed some 30 ft. outby the last open crosscut on the intake entry. The crosscuts are driven by a loading machine. In cross entry driving, where three entries are to be driven, the loading machine crew, working on the day shift, loads out the crosscuts as well as drives the companion entries from a series of headoffs from the McKinlay driven entries.

Power for the McKinlay machines is furnished over 1,000,000 circular mill feeder cable to within 300 ft. of the entry faces. The machine is equipped with a 250,000 circular mill trailer cable. Protection from short circuits is provided by two circuit breakers set at 600 amperes. The normal load on each machine is about 200 amperes at 240 volts.

A cross section of the entry cut by the machine has a total height of 7 ft. 2 in. and extreme width of 12 ft. 2 in. The fixed centers of the rotor bars are 5 ft. apart, giving a concave rib line with a 3 ft. 7 in. radius. The area of the cross-section is 76.6 sq. ft. An effort is made to leave approximately 9 in. of top coal. The machine is carried on four large roller wheels.

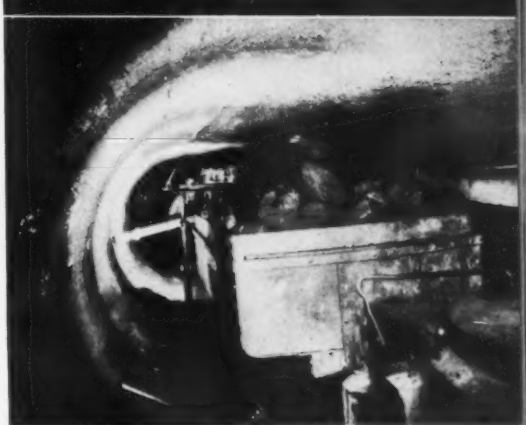
Top to bottom:

Joy loader starting to load out room neck behind McKinlays on development of panels —same machine loads out cross-cuts

Front end of McKinlay machine, showing cutting bits, arms, and rollers for breaking coal

Face of entry as left by McKinlays

Mine car being loaded under McKinlay rear conveyor



Top and Bottom Coal Must Be Left

Because of the weight of the machine, it is necessary to leave a coal bottom for the machine to work on. In the early use of the machine, before systematic methods were worked out for controlling the position of the rotor bars in the coal seam, the rollers broke through thin bottoms into the fire clay, at times necessitating the pacing of heavy timbers under the machine to get up onto solid bottoms again. The Illinois No. 6 seam of coal has a band of impurity near the floor known as blue band, which is generally more or less fixed in position relative to the top of the coal seam. The difference in thickness of the seam varies regularly with the distance from this blue band to the fire clay underlying the bottom of the coal seam. The machine operators have found that by keeping the position of a certain point on the cutter head a definite distance above the blue band, they maintain a rather uniform thickness of top coal and a satisfactory thickness of coal bottom. They also drill a couple of test holes to the top shale each shift as a further check on their position.

Sharp Curves and Grades Successfully Negotiated

In the earlier years of operation, it was not thought possible to drive through sharp pitching grades or around turns. Experience in the con-

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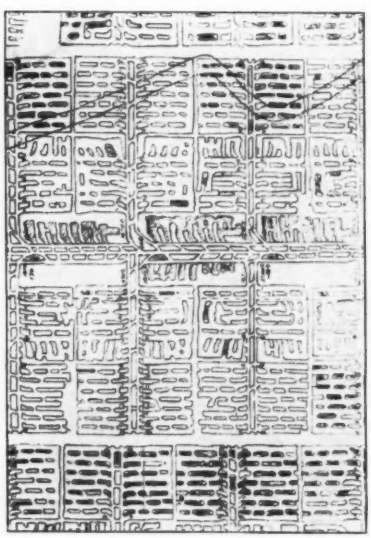
trol of machine alignment has made it possible to negotiate curves of as short as 80 in. radius. Both machines drove through one pair of entries which went from level down a 11 percent grade in 120 ft. and turned back up a 17 percent rise for a like distance without once breaking into the top rock or bottom fire clay.

Whereas it was thought necessary to tear the machines down and reassemble them in the early days to start a new pair of entries, it has been found possible to drive around curves and into new entries, thereby driving long stretches of entry without dissembling the machines.

Machines Effective in Driving Panel Entries

The driving of panel entries has proven very beneficial at this mine. When advance development falls behind in a cross entry, it has been possible to move the two McKinlay machines into the section and drive a complete set of panels up including the breakaway curves in 19 working days, and where the entry turnouts are developed by other means, the entry drivers have completed the panel entries in 12 working shifts. This same work with a single shift loading machine method requires 140 shifts and 91 shifts respectively.

The rate of advance is somewhat slower when the turnouts are driven with the entry drivers, and this method is not used except in cases where it saves the partial dismantling and moving of the machines. In panel entry driving the loading machine driving the crosscuts also turns the roomnecks which makes sufficient tonnage available for a day's loading.



Section of mine showing 11th and 12th—13th and 14th N. & S. panel entries (right and left center, top to bottom), developed by McKinlays

The rate of advance fluctuates slightly with driving conditions and facilities for making car change. In driving main and cross entries all cars are switched through doors in the two or three crosscuts back of the machine. In panel entries, where roomnecks are broken away to afford space for a few cars, the short switching and less traffic congestion reflects in the increased rate of entry advance.

Average of 40 Feet Per Machine Per Shift Over 10 Years

From November 20, 1927, to January 1, 1938, the mine had operated 1,596 days, and the two McKinlay entry drivers had operated 1,332 shifts. They had driven 106,208 ft. of entry at an average rate of slightly less than 40 ft. per machine per shift. During the first two years of operation they averaged 30 ft. per eight-hour shift. The average for the next four years increased to 45 ft. per eight-hour shift. From April, 1934, to January, 1938, the average has been 45 ft. per seven-hour shift. This rate has been more or less constant the past two years which would indicate that there is little probability of any marked improvement with the present conditions and machines.

Typical Time Study

A typical time study with the machine advancing 45 lin. ft. in seven hours is as follows:

Total number of cars loaded	33
Average weight per car (tons)	4.23
Average advance per car loaded (ft.)	1.36
Tons per ft. of advance	3.11
Total tons of coal loaded	140
Rate of advance when driving (in. per minute)	3.08

ANALYSIS OF CYCLE

	Total Time Min.	Per Car Min.
Driving and loading coal	175.0	5.30
Changing cars	78.5	2.38
Extending and repairing temporary track	17.1	.52
Waiting on haulage motors	27.0	.82
Setting jacks	17.8	.54
Setting bits	46.2	1.40
Repairs	32.4	.98
Miscellaneous	26.0	.79
Total elapsed time and cycle	420.0	12.73

The normal operating shift crew for the two McKinlay entry driving machines is as follows:

2 Operators
2 Operators' helpers
2 Tracklayers or utility men
3 Motormen
2 Tripriders
1 Foreman

Total 12 Men

Looking toward face along operator's side of machine

A normal day shift crew chargeable to these entry driving machines is as follows:

2 Repair men
1 Ventilation and blower man
2 Tracklayers
1 Bit sharpener

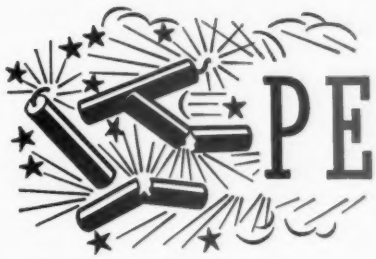
Total 7 Men

In moving these machines from one location to another, it is necessary to remove the rotor bars and cutting chain guides; flanged wheels are substituted for the tramming rollers, and the loading conveyor extending some 10 ft. to the rear of the machine is removed. The cost of such moving varies with the amount of repair work done when the machines are reassembled. The labor required to make a move will average around 25 man shifts. In some instances only one operating shift is missed while moving the machines, and at no time is it necessary to miss more than two operating shifts.

Timbering Costs Reduced

Very little operating time has been lost because of driving through sections of bad top. Roof falls occurring directly over the machine are easily handled due to the short drop to the machine. After timbering to secure the roof the rock is loaded off with the conveyors. Since no explosives are used and the entry driven has the roof supported by arches from the ribs, timbering costs are materially reduced. It has been found that the top will stand much longer on McKinlay driven entries than in entries driven by the usual or ordinary method. The machines have driven through faults and rolls without assistance. The rate of advance under

(*Concluded on page 70*)



PERMISSIBLES

There's no doubt about the number of teeth that are put into laws these days, but the big question is—are they wisdom teeth. . . .

■

Probably the idea of embargoing shipments of scrap metal abroad stems from the fact there is too much scrapping already. . . .

■

One thing you didn't learn in geography is that the world nowadays revolves on its taxes as well as its axis. . . .

■

Banks, declare Administration officials, are full of great stagnant pools of money. . . . Well, if that's so what we need is a syphon, not a pump primer. . . .

■

Newspaper dispatch: A two-year-old New Orleans boy can say yes in three languages. . . . He'll be a congressman by and by. . . .

■

Latest mining news from Canada reports the discovery of a lake whose bottom is lined with rich gold ore. . . . Now the question is whether to dig it up or just build a fort on top of it. . . .

■

Maybe things aren't so bad after all. . . . Business has picked up to the extent that many firms are ordering two bottles of black ink at a time. . . .

■

Prospectors, looking for gold, uncovered an ancient deserted city in Mexico. . . . The people probably paid the taxes as long as they could and then moved. . . .

■

We read in the papers where a seven-year-old boy was placed on the WPA rolls in Pennsylvania. . . . Don't worry. . . . It won't be a violation of the child labor laws. . . .

■

The way things are going in Europe the 1937 atlas may be as out of date as a 1914 automobile pretty soon. . . .

Congress, says a prominent Senator, should never be composed wholly of "yes" men. . . . We need a healthy minority of "no" men, he adds. . . . Yes, and a few "hell, no!" men wouldn't hurt either. . . .

—■—

Life in Europe, says an editorial, is just one routine maneuver after another. . . . And over here it's just one maneuver after another without any routine. . . .

■

This is the hurricane season in the South. . . . What the country really needs is some strong trade winds to stir up a buying and selling wave. . . .

■

Did you ever notice how our high officials regard Alaska as an important military outpost that requires inspection in the summer time, and in the winter it's the Canal zone that assumes importance and must be looked over. . . .

■

Maine didn't pay any attention when Postmaster General Farley urged it to get in step with the rest of the country. . . . Maine may have figured Farley meant lockstep. . . .

■

Some people figure it's possible to talk with the dead. . . . But did you ever hear about any comments from defeated candidates. . . .

■

Well, with copper back to 10 cents and better, the WPA isn't going to be so popular in Montana, Arizona, Nevada and Utah. . . .

■

A great many people believe in heaven. . . . But a lot of people are switching to California and $30 every Thursday. . . .

■

It takes a long time, says the President, to bring the past up to the present. . . . And what's the matter with giving a little thought to the future—with the $40 billion public debt. . . .

That Presidential commission sent to Europe to study the British labor laws have returned with the members' health greatly improved and all expenses paid. . . .

■

The Government, says an economist, is spending about as much money as it did during the World War. . . . Yeh, but nobody has tried to sell us a Liberty bond yet. . . .

■

Senator Pat McCarran easily defeated his 100 percent New Deal rivals. . . . When it's a question of the New Deal or silver, Nevada miners will take silver every time. . . .

■

The congressional committee investigating the TVA is about to run out of money. . . . And that's one of the troubles of the TVA. . . .

■

It looks like the President will have to get a new carpet to call people on. . . . The present White House "purgin' " is worn kind of thin. . . .

■

World conditions being what they are, it looks like the Nobel Peace Prize people will have to offer a reward for finding a candidate for the prize. . . .

■

Rich men by the hundreds are dying and going to hell, declares an evangelist. . . . After what they have been saying about the New Deal, they probably don't mind hell at all. . . .

■

One trouble about this Good Neighbor policy is that when good neighbors fall out the consequences are always worse than if the parties hadn't known each other before. . . .

■

The promises some of the candidates are handing out makes us realize how foolish it is to work for a living. . . .

V 24 10 OCT 38

With the **COAL DIVISION**

of the **AMERICAN MINING CONGRESS**

TREATED TIMBER in CENTRAL PENNSYLVANIA COAL MINES

A Report from the District Committee of Central Pennsylvania

IN September of 1931 the initial installation of treated mine timber was made in one of a group of drift mines located in the Central Pennsylvania coal fields. The timber was first installed in an important water-way, that handles the drainage of several mines, primarily as an experiment to determine the economy and effectiveness of several preservatives under severe conditions. A later installation was made in a main heading.

Decayed untreated replacement sets installed in 1931. Note fungi, broken cribbing and legs in running water. Three chalk crosses indicate set to be removed

Prior to this time the only timbers ever treated with a preservative at these mines were those used in the construction of rock dust barriers. The treating of these barriers began in May, 1930, when it was discovered that the life of untreated oak barriers was only about 3 years. The method of treatment consisted in dipping the preframed unseasoned oak timbers in a cold creosote bath for from 3 to 5 minutes. This simple treatment proved unusually effective in prolonging their useful life to 8 years.

These mines are situated in a region which even today is covered with second-growth timber suitable for roof supports in mines. The required timber is readily accessible, relatively low priced and can be delivered directly to the mines by truck. These favorable conditions in most cases until recently made the use of treated timber uneconomical.

The early timber installed in the more permanent sections of the mine, as the main headings and aircourses, has had an exceptionally long life, probably due to the quality of the first-growth timber still available prior to the present decade. At the present time the life of the untreated timber in the mines where studies were made is longer than in most other bituminous coal mines of Pennsylvania. Underground temperature and moisture conditions are identical with other mines, so it can be assumed that the relatively long average life of untreated timber lies in the timber itself. From studies made in these mines the life of the untreated timber varies from 5 to 10 years with an average of 7 years.

An important factor involved in the desirability of using treated timber has been the increasing cost of labor which is an important element in the cost of timber in place. Even though the life of untreated timber is relatively long, the use of treated timber may be warranted if the expected life of the section to be timbered is longer than the life of untreated timber. The possible economy lies not so much in the cost of the timber alone, but rather in the total cost in place and the inconvenience of making replacements.

Since the average life of a room may vary from 1 to 18 months and a room heading will not have a life of more than 5 or 6 years, it is obvious that no replacements of untreated timber are likely to be required in the productive sections of the mine. The more costly treated timber with a life expectancy of 4 to 5 times that of untreated timber would afford no economy. It is, of course, inadvisable to use treated timber in a mine despite an expected long life, if roof pressure is a factor in the life of the timber, for excessive roof pressure will break treated sets as easily as untreated sets, and the expected economy will not be attained.

Notwithstanding the fact that treated timber is still in an experimental stage at these mines, several important installations have been made which demonstrate the advisability of using treated timber under similar conditions in any coal mine.

INSTALLATION IN WATER-WAY

In 1928 an important water-way between one of the drift mines and a shaft mine in this group was completed. The main portion of this water-way consists of two graded entries spaced 50 ft. apart and driven 8,500 ft. through virgin coal to connect the drainage system of the former

to the drainageways leading to the shaft bottom at the latter mine. One of the entries is a heading with a track for maintenance work and a ditch, the other entry is used as an airway. The ditch conducts all the water from the drift mine and three adjoining drift mines to a sump at the bottom of a 670-ft. shaft whence it is pumped to the surface through a flanged cast iron pipe line installed in the shaft.

As the heading and airway were driven between the two mines it was necessary to place timbers as the faces advanced. About 85 percent of the heading was timbered with 3-piece sets consisting of 6-in. x 8-in. crossbars and legs. The airway was timbered throughout with rail-crossbars, 3-piece timber sets and center-posts. In both entries the sets were spaced on 5-foot centers or less, because of bad roof conditions.

A few months later nearly all the crossbars were broken by excessive roof pressure. Such conditions are prevalent in the Central Pennsylvania field, for until the roof stresses have become stabilized, timbers are not capable of controlling them. When the roof ceased working, the 6-in. x 8-in. sets were immediately replaced by stronger 3-piece sets. There were 1,400 of these sets placed in the heading, each consisting of an 8-in. x 10-in. x 9-ft.-0-in. crossbar, an 8-in. x 8-in. x 5-ft.-6-in. leg placed on the wire side, and an 8-in. x 8-in. x 6-ft.-6-in. leg set in the ditch. These were square-sawed and preframed unseasoned oak timbers, the legs being framed into the crossbars and inclined on a 1 to 6 batter. The sets were placed on 5-ft. centers.

Conditions Ideal for Fungus Growth

The ventilating current was conducted down the airway and returned by way of the heading. The intake air, by the time it had reached the entrance to the airway, had travelled about 2 miles from the shaft. The temperature and moisture conditions in the water-way were ideal for fungus propagation, and the spores from decaying sets in the outby airways were quickly sown in the untreated oak timber. This original timber was a high grade of mixed red and white oak, but by 1931 decay had so weakened the sets that they were being replaced at the rate of 50 a month. Falls were occurring frequently, where decayed sets had collapsed under normal roof pressure. The sets used in the replacement of these were duplicates of the original replacement.

Obstructing of the water-way by falls was an evident possibility, and as such an event might cause a suspension of work in several of the mines, it was deemed advisable to make the second replacement with treated timber. The use of steel was also considered, but was rejected because of the corrosive nature of the flowing water.

In 1931, square-edge and sound, framed southern yellow pine sets treated by the empty-cell process principally with zinc-meta-arsenate to ¼ pound per cubic foot retention were installed. These sets delivered in railroad cars cost $6.98 each; their cost in place was $8.73 or $1.25 more per set than would have been the case if untreated timber had been installed. Untreated oak sets including framing cost $5.73. The cost of labor for installing each set was $1.75 making the cost in place $7.48 per set.

Simple Calculations Prove Economy of Treated Timber Use

As the untreated timber had a life of only 3 years, it was reasonable to assume that under the prevailing conditions of decay, treated timber would probably more than double this life, or last at least 6 years. Based on this ultra conservative estimate of expected life of treated timber, the amount of money that would have to be set aside to assure replacement of the untreated timber if installed in addition to its original cost in place showed a remarkable economy in favor of treated timber. The method used in estimating the least possible saving is presented as an example of one way to determine if treated timber is more economical than untreated material.

A minimum ultimate saving having a present-day worth of $5.40 per set results from the use of treated timber in this case.

The treated sets consisted of an 8-in. x 10-in. x 10-ft.-0-in. crossbar, an 8-in. x 8-in. x 6-ft.-0-in. leg on the wire side and an 8-in. x 8-in. x 7-ft.-0-in. leg in the ditch. Both legs were framed into the crossbar and inclined on a 1 to 6 batter.

	Untreated Timber	Treated Timber
Initial Cost per Set	$7.48	$8.73
Cost of Replacement at End of 3 Years	7.48	No replacement
Present Worth of Expenditure 3 Years Hence (Discounting at 4 percent per Annum)	6.65	....
Present Worth of Expenditure to Assure 6 Years Protection	14.13	8.73

Looking down waterway, showing creosoted set. Note fungi on untreated cribbing, with non-decay-producing mold on treated timber

Choice of Preservatives—Toxic Salts or Creosote Oil

One of the factors governing the choice of salt preservatives is whether the preservative would leach out when in contact with water, since the preservative is injected into the timber in the form of a water solution. Certain types of salt preservatives are more resistant to leaching than other types and as there are included in these installations three of the leading salt preservatives, the results will be watched with special interest. Whether or not leaching occurs is perhaps unimportant insofar as the portion of the leg that is continually submerged is concerned. However, there may be a portion of the leg above the low water level and below the continuously dry portion that will be vulnerable to decay. This zone is being carefully watched so that the legs in the ditch can be replaced with timber preserved by other means in the event failure is indicated. In addition to the Z-M-A treated sets, 75 were treated with creosote, 75 with zinc chloride and 50 with Wolman salts, so that in the future more reliable conclusions could be reached as to the relative merit of the various preservatives from comparative data obtained by actual experience. Copper tags numbering the set were nailed to crossbar and leg, and the location of each set, its treatment and date of installation were carefully recorded. Periodic inspections are made to determine the condition of the sets, and no decay is evident in any of the 1,105 sets installed. Non-decay producing molds completely cover all the sets proving that decay conditions have not changed.

Set treated with zinc-meta-arsenite in waterway. Some untreated sets are also shown

Contrast between set treated with zinc chloride and fungus-covered untreated set is strikingly displayed

Treated Blocking, Lagging and Cribbing Added

In 1935 it was discovered that the untreated blocking, lagging and cribbing on top of the treated sets was badly decayed and was being crushed and broken by a moderate amount of roof pressure. In several instances this untreated blocking, breaking suddenly, allowed loose rock to fall and knocked out the set beneath and several adjacent sets. After a few months this became a serious matter, because all of the blocking was failing at once, and a dangerous obstructing of the ditch was imminent. A carload of miscellaneous pieces of blocking, lagging and cap-pieces treated with Wolman salts was ordered immediately and the decayed material removed from

each set and replaced with treated blocking. The untreated blocking had lasted only 3 years, which proved conclusively that the life of the best untreated timber under similar conditions would be only 3 years.

It is impossible to estimate the eventual life of the treated timber in the installation; it has now been in place for six years, about double the life of the untreated material, and it is safe to predict that these sets will last many years if the toxic seal which protects them from decay, is not broken. Probably there is no other place in any of these mines where conditions are so ideal for decay. Since treated timber has proven of value under these conditions, it will prove economical for installation elsewhere.

TIMBERING IN MAIN HEADING

AN investigation of the roof conditions in the main heading of another of these mines was made in September, 1934, to determine a practical method of roof support over a section 655 feet in length. The heading of this location is approximately 2,100 ft. from the drift mouth and contains two tracks for the haulage of empty and loaded mine cars.

The section contained barely a dozen center-posts throughout its entire length at the time of the investigation. The heading had been graded by excavating bottom rock in 1905 and the roof had remained in excellent condition until several months prior to the investigation. The roof and ribs were beginning to loosen and fall, endangering the passage of trips along the main haulageway.

The roof increases in height, from 8 ft. at the outby end to 15 ft. at about the center of the section and then tapers down to about 8 ft. at the inby end. An average roof span of 22 ft. prevails throughout the section. The length of the span has been gradually increasing because of the spalling of the ribs. The resulting increase in the top rock stresses caused the roof to loosen, and falls were imminent. Moisture in the ventilating air due to the proximity of the section to the drift mouth was probably the cause of the spalling of the ribs and especially of the softer fire clay and coal.

Vital Importance of Holding Roof

The roof condition at this location is extremely important, for the main heading of a drift mine in the Upper Kittanning seam is directly above the section on the lower main heading. Only 75 ft. of rock separate the two headings. The sounds of trips moving along the upper main are distinctly heard at the lower level. It is possible that these vibrations indirectly affected the roof above the main heading in the lower seam.

The investigation attempted to determine the most economical method of supporting the roof to preserve it before it became dangerously weak and actually broken through the bedding planes. If the roof had been allowed to deteriorate further, it would eventually be more difficult to support than the regular still unbroken roof strata.

Five Support Methods Considered

Several different methods of supporting the roof were considered, and the cost of each estimated. The predicted life of the main heading at this point was 25 years, and the life of untreated white oak timber under similar conditions was known to be 10 years.

The methods considered follow:

Method (*a*) consisted of building brick walls on both sides of the heading to a height of 7 ft., and setting 10-in. x 12-in. wood crossbars on 5-ft. centers on top of them in lieu of 3-piece sets and pony-sets. Brick walls with untreated sets cost $8,993 and with treated sets $9,962.

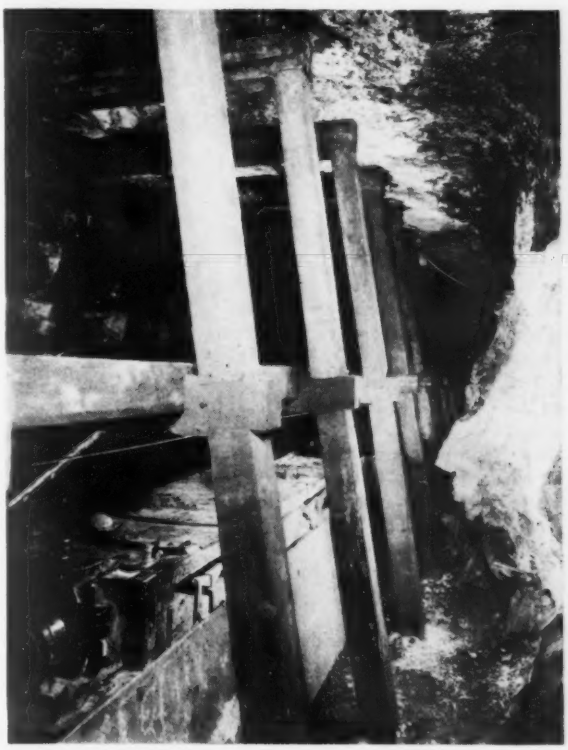
Method (*b*) consisted of building brick walls on both sides of the heading to a height of 7 ft., and setting steel I-beams on 5-ft. centers as crossbars with wooden posts and half-headers on top of the I-beams to support the roof. Brick walls and steel with untreated posts cost $9,652 and with treated posts $10,123.

Method (*c*) consisted of building brick walls surmounted by a brick arch. Posts with half-headers were to be installed on top of the arch to support the roof. Total cost, $7,922.

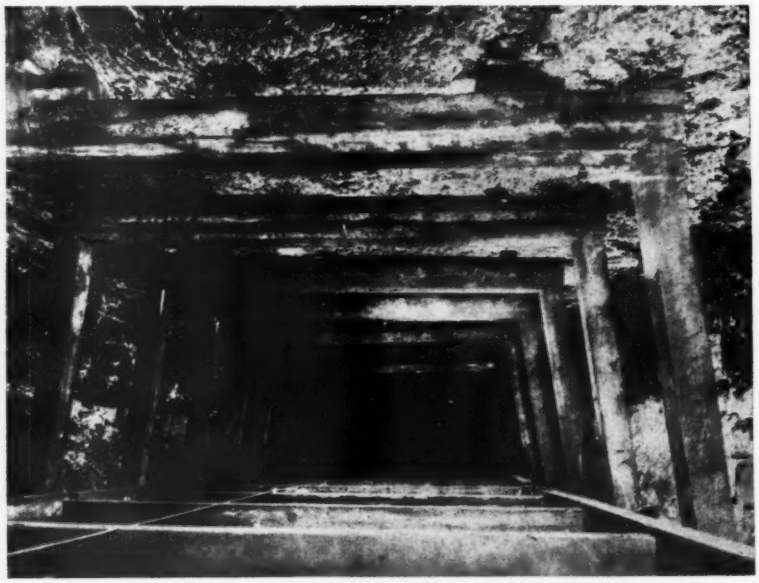
Method (*d*) consisted of all-steel sets, with I-beams for crossbars, H-sections for legs and a few treated posts on top of the I-beams to support the roof. Total cost, $4,053.

Method (*e*) consisted of all-wood sets composed of 3-piece, 3-piece and pony, and 3-piece and post-sets on 5-ft. centers. With untreated timber the cost was $1,871 and with treated timber, $3,113.

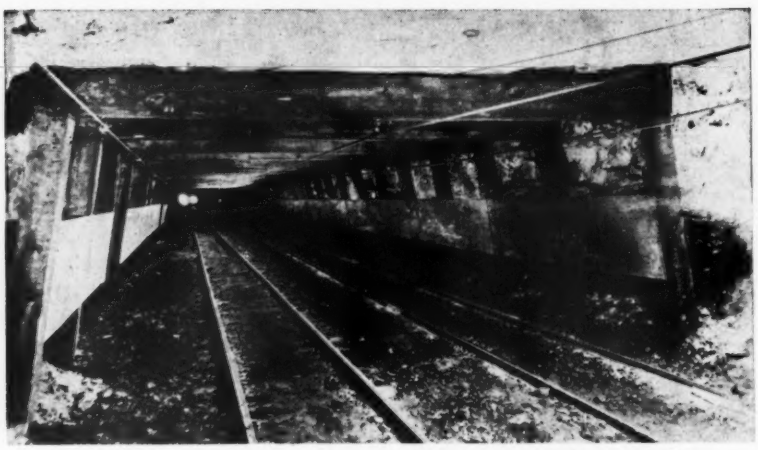
The methods of support utilizing the brick walls were discarded because their construction for this particular installation did not warrant their expense. Steel supports were also discarded, as being too expensive; besides,



Looking outby on main heading, showing method of framing treated sets where roof is relatively high



Pony sets on top of 3-piece sets. Note framing, cross braces, and alignment



Looking inby on main heading. Note ample clearance and timber guard-plates

their installation in the proximity of the drift mouth would involve additional maintenance charges for frequent painting. The use of timber would offer an entirely satisfactory means of support from every operating viewpoint. The unusually long life expected of untreated timber because of its being located in fresh air resulted in a close economic balance between treated and untreated timber. The intangibles, however, indicated the use of treated timber as more desirable than untreated timber.

Preframed Timber Treated With Wolman Salts Chosen

The section under consideration was dry, with electric haulage indicating a possible fire hazard. A salt treatment was therefore considered more desirable than creosote, and Wolman salts was finally selected. Preframed, square-edge and sound, seasoned southern yellow pine treated by the full-cell process according to the American Wood Preservers' Association specifications to 1/3 lb. per cubic foot retention was specified. The entire shipment of 131 miscellaneous sets contained 38,891 ft. b.m. or exactly 4 carloads.

The carloads were ordered by sets and the members forming each set were piled in the carload in order, so that the sets in the bottom of the car were on top of the pile when the car was unloaded, and as planned, were the first installed.

In order to insure a neat appearance and keep the crossbars at the same elevation above the top of the rail, holes were dug in the solid bottom every 5 ft. and filled with concrete level with the bottom of the ties, so that the legs of the sets would have a uniform foundation.

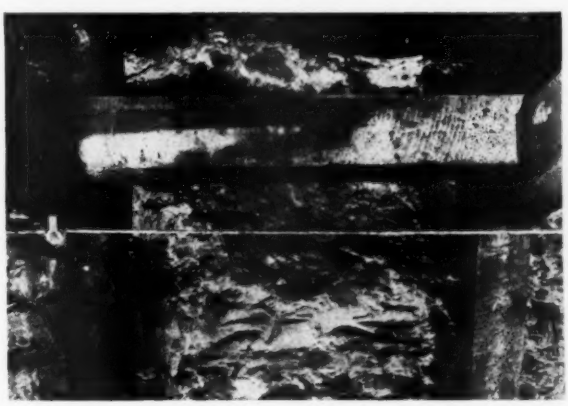
Crossbraces and Guard Plates Utilized

As the sets were installed, two crossbraces were placed between adjacent sets to space them exactly 5 ft. apart and fasten them together securely. Every fifth space was left open to prevent the entire group of sets from collapsing should a sudden roof break or locomotive-derailment displace several of the sets in succession. Copper-bearing sheet steel plates were fastened to all legs of the main sets to act as a timber guard and prevent the sets from being displaced, should a car or locomotive derail. Openings were left in these plates every 45 ft. to provide shelter holes. Date nails were placed in the members of the main sets in accordance with adopted standards.

Since the timber has been installed, spalling has diminished, probably because the roof pressure has been removed from the ribs by the supporting sets. The installation is in excellent condition today, no signs of decay are present although a few of the sets are covered with mold.

Submitted by:

THE DISTRICT COMMITTEE OF CENTRAL PENNSYLVANIA.



Close-up of treated set, showing method of fastening cross brace

Me and "Prunes"

By RUPE SHERWOOD *

So poor old Prunes has cashed in—Too bad. Still, in a way
I'm glad the old boy's eased off and is calling it a day.
I'm going to miss him scand'lous; the world won't seem the same
Not having him a-standin' here hee-hawing in the game.
We've sure drawed cards together aplenty; Prunes and me;
We've bucked the play in every way the cards was dealt to we;
Sometimes we filled our hands and won—so seldom 'twas a joke—
Most often we just bob-tail flushed and wound up stony broke.
But no matter if we win or lose, old Prunes hee-hawed the same;
The trails were all alike to him; it all was in the game
We played with fortune. Come the breaks our way or plumb 'gainst us
Old Prunes just toted fair and stuck 'thout making ary fuss.
When grub was plenty, grass was long, and trails was smooth he took
His share and share alike with me. If things went scant he shook
His head and laffed: "Hee-haw—Hee-haw!" The philosophic cuss!
And dined on greasy gunnysacks an' bacon rinds—an' wuss.
I've prospected in company with every kind of man
That ever hit these hills. Sometimes I'd meet with one who'd pan
Out fairly good; but mostly they was allus looking out
For Number One. I reckon you know what I'm talking 'bout.
I've throwed in with 'em—every race an' breed an' color, too—
An' found 'em all just lackin' of some one thing—maybe two.
Some had no guts; some had no sense; some wasn't honest; so
Not one of them could average up with Prunes, my old burro.
For Prunes was faithful, honest, an' he never tried to shirk
From doin' of his bit, no matter how damned hard the work.
And he didn't grouch and grumble when the eats were kinda short;
He took all things just as they come. Old Prunes was a good sport!
An' I don't think he delib'rately laid down on me when come
His time to peter out and hit the trail for Jackass Home.
But I'm kinda peeved to think he's goin' it upon his own
An' leavin' me behind to play the deal out all alone.
I'm not much on religion; and sometimes I've a doubt
About this "Immortality" sky-pilots rave about.
But I'm gamblin' if there be another life after this one
It won't be just restricted to the things called man alone.
But every thing now livin' will surely live again—
(I know a hundred that deserves to, more than most of men)
An' if they do, why, sure as shootin' 'mongst those heavenly tunes
I'll betcha fifty bucks we'll hear the "Hee-haw" of old Prunes.
Maybe the preachers got it right. I hope they have! I'd like
Along with Prunes, among those golden fields to take a hike.
We'd sure find pay dirt if it's there. You betcher life on that.
For Prunes an' me knows values when we see them—that is flat!
An' if, belike, they shouldn't reckon us just good enough
To trail 'round with the gang up there, and go to treat us rough
An' slide us down the chute to where no icy moss festoons,
We'd prospect there for sulphurets—and find 'em, too. Hey, Prunes?

—*Summit County Journal Print.*

* See Contents page.

HOWARD I. YOUNG
President
American Mining Congress

Come to the Los Angeles Convention and Exposition October 24-27. Profit by studying the display of the latest new and improved mining appliances and equipment, and join with the many others of the industry who will also be there and protest against the increasing external influences that oppress our national basic industry. More and more of our output which should be applied to the improvement and broadening of the industry is taken in taxes; more needless injurious laws threaten. Your protest as an individual is futile, but when joined with the others of the American Mining Congress in convention it commands attention, respect and probable results. Do not fail us.

Stanly A. Easton

President,
Bunker Hill & Sullivan Mining
& Conc. Co.

For our 5th Annual Metal Mining Convention and Exposition, the Program Committee are presenting a very interesting series of discussions on taxation, labor, legislative, operating and marketing problems with which we are all concerned. Those active in the mining industry today must give more attention to problems of national scope, and this meeting offers an opportunity to formulate a constructive platform for the industry. An especially valuable feature will be the exhibits of the latest developments in mining equipment.

I feel that the recent Western meetings of the Congress have accomplished much for the industry, and your participation in the coming Convention is earnestly urged.

H. S. Spence

President,
American Zinc, Lead & Smelting Co.

STANLY A. EASTON
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Los Angeles will be host this year to the American Mining Congress' 5th Annual Metal Mining Convention and Exposition.

Mining men of prominence are generously contributing their time and efforts to make this an outstanding meeting. The talks and discussions on up-to-the-minute mineral industry problems will be definitely beneficial; the interesting exhibits, showing the latest in mining and milling equipment, will suggest many cost-saving ideas; entertainment by our Southern California friends will be delightful—and probably most important to all of us, we are again to have the privilege of seeing our old friends and enjoying the pleasure of making new ones.

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Vice President,
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THOS. H. O'BRIEN
National Chairman
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ROBERT LINTON
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Los Angeles is proud to be the host city to the 5th Annual Metal Mining Convention and Exposition of the American Mining Congress.

This meeting, like others in the past, brings together operators from all over the metal mining west. It will undoubtedly serve in an important way to unify the industry in its approach to the solution of nation-wide problems of mutual concern. Mining men will also see in the exposition the latest developments in mining and milling methods and equipment, and will find much that is interesting and instructive in the operations to be visited on the various trips. It is a convention that no one who is active in metal mining should miss.

Robert Linton

Mining Engineer.

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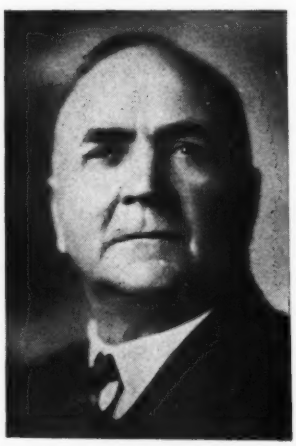

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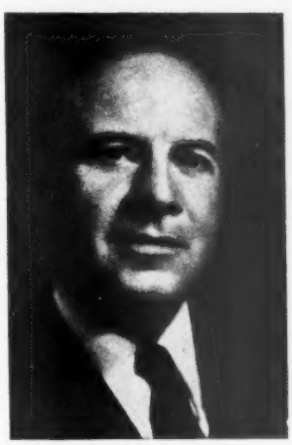

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HARRY VIVIAN
Calumet & Hecla Cons. Copper Co.
CARL ZAPFFE
Iron Ore Properties, Northern Pacific Rwy. Co.

Arizona

ROBT. W. THOMAS
Chairman
Gen. Mgr., Nev. Cons. Copper Corp.

E. F. BOHLINGER
Flux Mine
CLIFF CARPENTER
Arizona Magma Mining Co.
MILES M. CARPENTER
Tucson
M. CURLEY
New Cornelia Br., Phelps Dodge Corp.
WILLIAM KOERNER
Magma Copper Co.
CHAS. F. WILLIS
Arizona Small Mine Oprs. Assn.
A. S. WINTHER
Miami Copper Co.

Southeast

C. E. ABBOTT
Chairman
Vice Pres., Tennessee Coal, Iron & R.R. Co.

H. A. COY
American Zinc Co. of Tenn.
FRANCIS H. CROCKARD
Republic Steel Corp.
ERSKINE RAMSAY
Alabama By-Products Corp.
HERBERT S. SALMON
Salmon & Cowin, Inc.

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Program Committee—

Montana

J. J. CARRIGAN
Chairman
Gen. Supt. of Mines,
Anaconda Copper Mining Co.

H. C. BACORN
Butte
W. L. BELL
Butte Highlands Mng. Co.
GUST CARLSON
Montana Cons. Mines Corp.
WM. G. FERGUSON
Montanans, Inc.
ALEXANDER LEGGAT
Butte
J. D. MACKENZIE
American Smelting & Refining Co.
F. A. THOMSON
Montana School of Mines
CARL J. TRAUERMAN
Montana Mining Assn.

Washington

ROGER O. OSCARSON
Chairman
Pres., Northwest Mining Assn.

C. P. BROWNING
Chelan Div., Howe Sound Co.
W. A. CASTLETON
Alaska Sunset Mines, Inc.
ROY H. CLARKE
Spokane

Washington—Continued

D. I. HAYES
American Zinc, Lead & Smelting Co.
BLISS MOORE
Spokane
EARL K. NIXON
State Dept. of Geol. & Mineral Industries
MILNOR ROBERTS
University of Washington
M. H. VAN NUYS
West Coast Mineral Association

Tri-State

G. W. JOHNSON
Chairman
Mgr., American Zinc Lead & Smelting Co.

C. A. BECK
Beck Mining & Royalty Co.
J. L. CADDEN
The Century Zinc Co.
C. F. DIKE
Oklahoma-Interstate Mining Co.
H. W. HARRISON
Commerce Mining & Royalty Co.
L. G. JOHNSON
Federal Mining & Smelting Co.
EVAN JUST
Tri-State Zinc & Lead Ore Producers Assn.
W. T. LANDRUM
Cortez-King Brand Mines Co.
GEORGE O. PEARSON
Lawyers Lead & Zinc Mining Corp.

Northeast

HARRY Y. WALKER
Chairman
Vice Pres., American Smelting & Refining Co.

R. R. ECKERT
U. S. Copper Assn.
ANDREW FLETCHER
St. Joseph Lead Co.
CHESTER A. FULTON
Southern Phosphate Corp.
ERNEST V. GENT
American Zinc Institute
D. F. HALEY
Climax Molybdenum Co.
VAN DYNE HOWBERT
The American Metal Co., Ltd.

HARRY Y. WALKER

RUSSELL B. PAUL
The New Jersey Zinc Co.
L. M. WILLIAMS, JR.
Freeport Sulphur Co.
FELIX E. WORMSER
Lead Industries Assn.

Mississippi Valley

W. T. LUNDY
Chairman
Vice Pres. & Gen Mgr., Freeport Sulphur Co.

J. M. BLAYNEY
Rosiclare Lead & Fluorspar Mng. Co.
H. A. BUEHLER
Rolla, Missouri
A. C. CALLEN
University of Illinois
F. O. CASE
International Smelting & Refining Co.
JAMES A. CASELTON
St. Louis Smelting & Refining Co.
W. R. DICE
The Eagle-Picher Lead Co.
M. M. LEIGHTON
Urbana, Illinois
EDWIN R. SHOREY
University of Wisconsin
W. N. SMITH
Vinegar Hill Zinc Co.

Los Angeles Host to Metal Mining Men

Mill and surface plants of Cactus Mines Company, Mojave district, California, in its desert setting

LOS ANGELES HOST to METAL MINING MEN

● *5th Annual Metal Mining Convention and Exposition of the American Mining Congress to Spotlight Industry's Problems*

INTEREST and attention of the entire metal mining industry will soon be focused on Los Angeles, Calif., the host city of the 5th Annual Metal Mining Convention and Exposition of the American Mining Congress (Western Division), where leaders in the industry will gather from all parts of the country October 24 to 27 to participate in an event that is rapidly assuming first place on the annual calendar of metal mining activities.

Sponsored by the Western Division of the American Mining Congress, headed by Stanly A. Easton, president, Bunker Hill and Sullivan Mining and Concentrating Company, this meeting is open to all those who are active or interested in promoting the welfare of the mining industry.

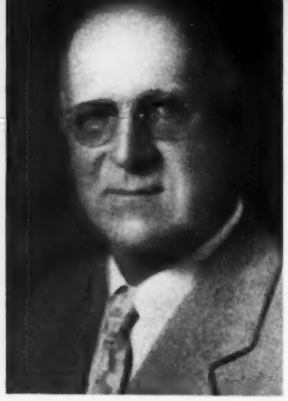
These meetings are held in the fall each year at a convenient location in the West, and bring together mine executives and operating men from near and far for mutual discussion of economic, legislative and operating problems that beset the mining industry, together with a large and representative group of equipment and supply manufacturers for display of their latest product developments. This is the one and only event combining on a national scale these two very important features, and must be seen to appreciate fully the educational opportunities afforded.

Sharing the burden of planning an interest-compelling program and setting the stage for the memorable gathering are Thomas H. O'Brien, vice president and general manager, Inspiration Consolidated Copper Company, who is national chairman of the Program Committee; and Robert Linton, prominent Los Angeles consulting engineer, who heads the General Committee on Arrangements. Aiding these men is a large corps of able and active assistants who have spent most generously of their time and effort in assuring a most successful gathering. Howard I. Young, president of the American Zinc, Lead and Smelting Company, is president of the American Mining Congress, and has as usual devoted much thoughtful attention to plans for the meeting.

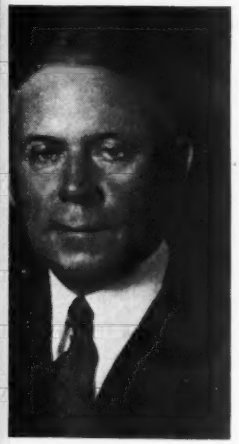
The convention sessions and exposition will be held in the beautiful and spacious Ambassador Hotel—the sessions in the auditorium with ample capacity and comfortable seats for all, and the exposition in the attractive Fiesta, Spanish and Colonial Rooms. A passageway from the exposition hall direct to the auditorium will be built especially for the meeting in order to facilitate movement between the two halls.

V 24 I 10 OCT 1938

VILLIAM HONNOLD



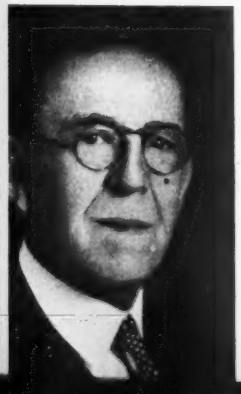
JAMES E. BABCOCK



VM. C. BROWNING

L. K. REQUA

DR. L. D. RICKETTS



The convention and exposition will get under way at 9 o'clock Monday morning, October 24, at which time delegates will begin to assemble for registration and inspection of the many splendid exhibits prior to the initial session, which will convene promptly at 10:30.

Vital Subjects on Program

Assisting Chairman O'Brien of the Program Committee in planning a series of discussions on vital economic, tax, tariff, labor, fiscal and operating problems confronting the industry today are the State and District chairmen and members shown on pages 56 to 58. Perusal of the final program on page 63 attests to the excellency of work done in choosing timely and pertinent subjects and prominent leaders to discuss them.

It will be noted that the eight sessions will be devoted to presentation of papers on the following general subjects: Western Mining Problems, Monday morning; Mining and the Securities and Exchange Commission, Monday afternoon; New Developments in the Industry, Tuesday morning; Legal, Tariff and Public Relations Problems, Tuesday afternoon; Health and Safety, Wednesday morning; Prospects for the Metals, Wednesday afternoon; Taxation, Thursday morning; and Labor, Thursday afternoon.

So applicable are all the papers embraced within the above categories to present-day mine management and operation that it is difficult to single out any that merit particular mention. However, with labor relations drawing more and more attention from industrial management, from government and the public, special interest undoubtedly will be attached to the address of Senator Edward R. Burke of Nebraska on the subject, "Labor Relations at Home and Abroad." Much of Senator Burke's time during the past few months has been devoted to a searching study of defects in present national labor legislation, and to a careful analysis of laws and experience dealing with labor matters in the United States compared with several European countries. Now that President Roosevelt's special committee has reported on labor matters, both in Great Britain and Sweden, it will be particularly interesting to learn results of Senator Burke's investigations. Informed observes in Washington expect that he will champion sorely needed revision of the Wagner Bill in the coming session of Congress.

Another session that will doubtless prove popular with delegates is the symposium on present economic status and future outlook for major and minor metals and the principal nonmetallics, reviewed by prominent leaders in their fields, including Senator Key Pittman of Nevada, Howard I. Young, Stanly A. Easton, R. C. Allen, R. M. Hardy and Dr. John W. Finch.

Booming activities in Philippine mining, a very live topic in this country, will be touched upon by Judge John W. Haussermann, president of Benguet Consolidated Mining Company and Balatoc, the leading gold producers in that country, in relating some of the principal mining problems encountered there.

In view of serious world unrest at the present time, unusual interest will be attached to the address by Congressman James G. Scrugham of Nevada, on the subject "The Mining Industry and National Defense." This topic is currently receiving searching analysis by experts in Washington, and Congressman Scrugham is in intimate touch with these developments.

Secretary of Interior Harold Ickes has been invited to address the convention; Administrator Andrews of the new Wage-Hour Division of the Labor Department has been urged to send a representative to the meeting to explain latest developments in administering the Wages and Hours Act, and

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TO BILL FROM ED *

Dear Bill:

Take a look at the attached program for the big meeting of the American Mining Congress at Los Angeles, October 24-27.

If you have not had a vacation, Los Angeles is the city between October 24-27. The men who keep the wheels turning in the mining industry will be there. They know how to play as well as work. If there is any question in your mind about Los Angeles being the right place to enjoy yourself during October, write the Los Angeles Chamber of Commerce. Los Angeles is a permanent camp.

If you have had your vacation, and are now battling to get a satisfactory solution to the problems that confront you, gather them up and take them with you to the meeting. You will meet some friends at the Mining Congress meeting who have the right answers for many of them.

The boys representing equipment manufacturers will also be there with many first-class exhibits. A few hours spent with them will get you abreast of the times, and may give you some pregnant ideas that can be cashed.

If you have that complex that causes you to think you can't spare the time for this meeting, you better brush up on history and metal statistics. Mines, smelters, and mills will be operated long after Satan has fried your hide.

Meet me there October 24-27.

Yours sincerely,
ED.

* *Courtesy, E. H. Snyder, Stockton, Utah.*

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an invitation has been extended the National Labor Relations Board to have a representative present the Board's viewpoint.

Other prominent men who will participate in the program include: Robert M. Searls, Victor J. Hayek, Robert S. Palmer, Samuel H. Dolbear, Chester T. Lane, Howard N. Lary, Harlan H. Bradt, Paul Klopstock, Church Holmes, C. T. Oughtred, Harley A. Coy, Judge Edgar T. Zook, Evan Just, Thomas E. Campbell, Wm. B. Daly, James A. Caselton, H. C. Henrie, Ellsworth C. Alvord, Granville S. Borden and A. G. Mackenzie. The program has been arranged to afford plenty of time for floor discussion of all papers, and all who have had experience with any of the subjects are invited and urged to express their views.

One of the principal functions of the meeting, intimately related to the program, is the formulation of a Declaration of Policy—a concise statement of the concerted views of the metal mining industry on vitally important economic and social questions facing it at the present time. The Resolutions Committee will present its report at the final session of the convention Thursday afternoon.

A joint luncheon meeting of the Board of Governors of the Western Division and the Board of Directors of the American Mining Congress will be held Thursday noon.

Final Arrangements Completed

Detailed plans whipped into final shape by the General Arrangements Committee, headed by Robert Linton, after months of diligent work will assure all guests a week of genuine pleasure. Assisting Mr. Linton are the following members of the committee: James E. Babcock, William C. Browning, Cooley Butler, T. F. Cole, Joseph A. Hartley, A. A. Hoffman, George Holmes, W. L. Honnold, F. M. Jenifer, Howard C. Kegley, F. W. Maclennan, Harvey S. Mudd, Lawrence K. Requa, Dr. L. D. Ricketts, Frank R. Wicks and Philip Wiseman.

Also participating in this work are the following members of various committees who have devoted a most generous amount of time and energy to their tasks of planning specific functions:

Entertainment. — H. W. Howe, chairman; J. G. Murphy, P. G. Spilsbury, Harold Thrane and C. B. Tibbetts.

Annual Dinner.—M. J. Holmes, chairman; E. N. Greenleaf, O. H. Griggs, E. R. Cullity, Tom Hamilton, John Herman, E. L. Hill and P. B. Butler.

Reception.—Julian Boyd, chairman; Walter D. Abel, Ralph Baverstock, Victor Bongard, Alvin B. Carpenter, James F. Collins, Frederick Cowans, John F. Duling, Francis Gage, J. Wesley Gebb, Victor J. Hayek, Chas. S. Howe, D. Paul Lindau, D. A. Lyons, F. H. Minard, George W. Nilsson, J. W. Prout, Jr., R. W. Prouty, C. C. Randall, G. F. Sondraker, George R. Sullivan, H. B. Summers, H. R. Van Wagenan, George E. White, E. E. Whiteley, W. B. Wickersham, A. McQ. Williams and A. T. Wintersgill.

Excursions.—E. O. Slater, chairman; Clifford L. Ach, David D. Baker, F. M. Beeson, George A. Bisbee, E. C. Blodgett, H. Clifford Burton, C. F. Bonnet, A. W. Frolli, C. A. Kumke, Walter Lofgren, D. C. Maddox, Harry Lee Martin, Roy W. Moore, Henry Mulryan, R. L. Riggs, John Rogers, C. O. Sanford, R. E. Scott, Jr., George Trent and W. B. Tucker.

Hotels.—G. A. Joslin, chairman; Roy Cornell, Wm. R. Larson, H. B. Menardi and B. M. Snyder.

Exhibits.—Yale D. Hills, chairman; C. W. Gernholtz, J. A. Garrett, G. M. Gilmore, H. L. Morrison, F. C. Warren and H. V. Welch.

Finance.—Wm. C. Browning, chairman.

Welcoming Luncheon

Delegates will receive a rousing and cordial reception to Los Angeles and the convention at the welcoming luncheon on Monday noon at the Ambassador Hotel. With Robert Linton presiding, greetings will be extended by Governor Frank S. Merriam, of California, and Mayor Fletcher Bowron, of Los Angeles. Responding for the delegates will be Howard I. Young, president of the American Mining Congress; Stanly A. Easton, chairman of the Western Division; Thomas H. O'Brien, chairman of the Program Committee, and Roy L. Cox, chairman of the Manufacturers Division.

Chairman Julian Boyd and all members of his Reception Committee will be on hand throughout the convention to make sure that all delegates receive a warm welcome. Well coordinated services and comfortable and reasonable accommodations at the many hotels serving the convention are assured through activities of the Hotels Committee, chairmanned by Garnett A. Joslin. Finances for various phases of the meeting have been arranged for by the Finance Committee, headed by W. C. Browning.

Entertainment for Everyone

One of the primary aims of these meetings is to bring everyone together midst attractive surroundings to relive pleasant memories with old acquaintances and hook up with a lot of new friends. This can be done with a maximum of enjoyment during the hours of relaxation in the evening, and the Entertainment Committee, headed by H. W. Howe, is serving a fine bill of unusually attractive evening features that are bound to appeal to all.

"Bill" and "Hank" undoubtedly will have had a few friendly words with old acquaintances during the first day, but lots of other friends will have been missed, and during

F. W. MACLENNAN

JOS. A. HARTLEY

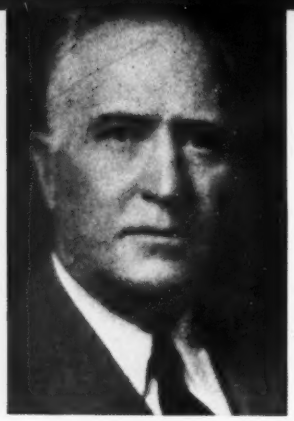
PHILIP WISEMAN

FRANK R. WICKS

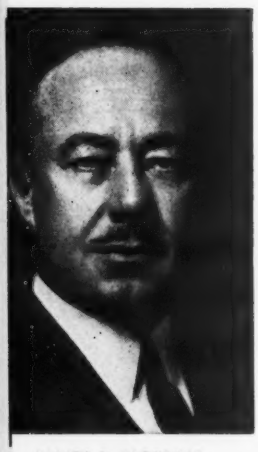
H. S. MUDD

A. A. HOFFMAN

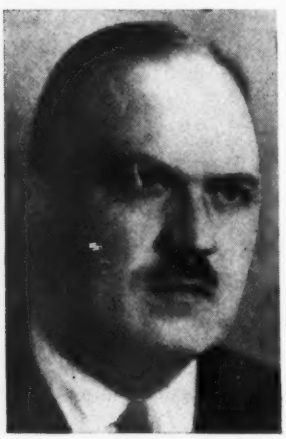
EDWARD B. GREENE



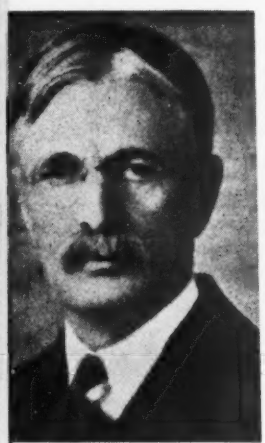
D. D. MOFFAT



JAMES R. HOBBINS



MERRILL E. SHOUP

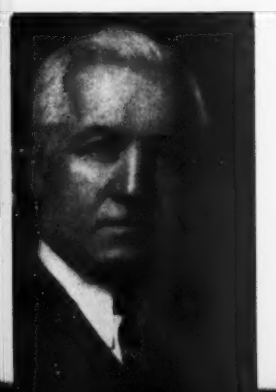


CLINTON H. CRANE

ARTHUR E. BENDELARI

DONALD A. CALLAHAN

CHARLES H. SEGERSTROM



Representatives of the Metal Mining Industry on the Board of Directors American Mining Congress

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the rush of busy sessions conditions are not particularly conducive to developing new friendships. For this reason, the first evening has been planned as an informal "Get Acquainted" party, with dancing to excellent music and a novel program of entertainment to be held in the ballroom of the Biltmore Hotel.

A real treat that will long be remembered is in store for convention visitors on Tuesday night, when the thrilling adventures and romance of Early California Days will be enacted in quaint style in the Spanish surroundings of Olvera Street, a small section in Los Angeles where the buildings are unchanged from the days when Mexico governed California. A delicious barbecue dinner will be prepared in pits in the patio of one of the original Spanish adobe houses by Romero, who is widely known as the "barbecue king" of Southern California. None will wish to miss this bang-up evening of gaiety and merriment.

Wednesday night has been left open to afford guests the opportunity of choosing whatever form of amusement particularly appeals to them, from the many and varied attractions close at hand. This will be a convenient "spot" on the program for all movie addicts among the delegates to view the bright lights and glamor of Hollywood.

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The Colorado School of Mines Alumni Association will hold its meeting at the Clark Hotel, 426 South Hill Street, on Wednesday, October 26, at 6.30 p. m. and invites all alumni and guests to attend.

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Those mining men who have attended previous conventions and expositions of the Western Division of the American Mining Congress are cognizant of their great value. The papers presented at these meetings on matters of current common interest to the industry and the discussions which they provoke are most informative.

The agenda of the convention to be held in Los Angeles, October 24 to 27, 1938, is self-evident as to its excellence, and attendance should be amply repaid. The exposition, which runs concurrently with the convention, presents a splendid opportunity to keep abreast of the progress in equipment, design, and efficiency.

D. D. Moffat

Vice President, Utah Copper Co.

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C. F. Kelley to Address Annual Dinner

Climaxing the convention activities on Thursday night will be the annual dinner, with the world-famous Cocoanut Grove serving as a most appropriate setting. Cornelius F. Kelley, president of the Anaconda Copper Mining Company, will be guest speaker at this memorable event, and guests can count on a message of unusual interest from one of the world's foremost mining men. Harvey S. Mudd, widely known mining man of Los Angeles, will act as toastmaster. Special entertainment is also being worked up for this gala occasion by a committee headed by M. J. Holmes.

Millions have thrilled to the delightful music of Wayne King's orchestra over the radio, but comparatively few have had the pleasure of dancing to the tunes of this rhythm king. His orchestra will be playing at Cocoanut Grove during the entire week of the convention, and will of course furnish the music for the annual dinner. Any stray jitterbugs among the crowd, who revel in prancing to the tunes of such old favorites as "Loch Lomond," "Liebestraum," "Annie Laurie," etc.,

(*Continued on page 64*)

— Program —

MONDAY, OCTOBER 24

9:00 A. M. REGISTRATION AND INSPECTION OF EXHIBITS

10:30 A. M. FIRST SESSION—WESTERN MINING PROBLEMS

Opening of Convention
Julian D. Conover, Secretary, American Mining Congress
Chairman: Chas. H. Segerstrom, Pres., Nevada-Massachusetts Co.
The Right to Mine—Its Protection Against Encroachment
Robert M. Searls, Counsel, Newmont Mining Corp.
Our Public Land Policy
Victor J. Hayek, Secy., Mining Assn. of the Southwest
Coordination of State and Federal Aid to Mining
Robert S. Palmer, Secy., Colorado Chapter, American Mining Congress
Appointment of Resolutions Committee

12:15 P. M. LUNCHEON AND WELCOME TO DELEGATES

Cocoanut Grove, Ambassador Hotel
Presiding: Robert Linton, Los Angeles, Calif.
Welcome to California
Hon. Frank F. Merriam, Governor of California
Hon. Fletcher Bowron, Mayor of Los Angeles
Responses
Howard I. Young, President, American Mining Congress
Stanly A. Easton, Chairman, Western Division
Thomas H. O'Brien, Chairman, Program Committee

2:15 P. M. SECOND SESSION—MINING AND THE SECURITIES AND EXCHANGE COMMISSION

Chairman: James Owen, Denver, Colo.
A Study of Mine Security Registration and Recommendations for Improving Procedure
A Report of the American Mining Congress Committee for Cooperation with the S.E.C.
By Samuel H. Dolbear, Chairman
The Viewpoint of the Securities and Exchange Commission
Procedural Problems
Baldwin B. Bane, Dir., Registration Division, S.E.C.
Engineering Problems
Howard N. Lary, Regional Administrator, S.E.C., Denver, Colo.
The Registrant's Viewpoint of S.E.C. Procedure
Harlan H. Bradt, Pres., Bralowe Corporation
Paul Klopstock, Chairman of Board, Austin Silver Mining Co.

7:00 P. M. "GET-TOGETHER" NIGHT

Ball Room, Biltmore Hotel
Dining and Dancing

TUESDAY, OCTOBER 25

10:15 A. M. THIRD SESSION—NEW DEVELOPMENTS IN THE INDUSTRY

Chairman: J. C. Kinnear, Gen. Mgr., Nevada Mines, Nevada Consolidated Copper Corp.
Mining Problems in the Philippines
Judge John W. Haussermann, Pres., Benguet Consolidated Mng. Co.
Metallurgy of the Coeur d'Alene Silver Ores
W. Church Holmes, Met. and Mill Supt., Sunshine Mng. Co.
Improvements in Crushing and Grinding Practice
C. T. Oughtred, Conc. Supt., Consolidated Mng. & Smelting Co. of Canada, Ltd.
Slusher Loading in Driving Inclines
Harley A. Coy, Supt. of Mines, American Zinc Co. of Tennessee
Final Submission of Resolutions to be Referred to Resolutions Committee

2:15 P. M. FOURTH SESSION—LEGAL, TARIFF, PUBLIC RELATIONS PROBLEMS

Chairman: P. G. Beckett, Vice Pres., Phelps Dodge Corp.
To What Extent is Mining Involved in Interstate Commerce
Judge Edgar T. Zook, Counsel, Idaho Maryland Mines Corp.
Discussion:
John P. Gray, Mng. Attorney, Coeur d'Alene, Idaho
Application of Reciprocal Trade to Mining
Evan Just, Secy., Tri-State Zinc & Lead Ore Producers Association
The Mining Industry and National Defense
Hon. James G. Scrugham, Congressman from Nevada
Public Relations of the Mining Industry
Thomas E. Campbell, Exec. Vice Pres., Mining Exhibits, Inc.

7:00 P. M. "EARLY CALIFORNIA DAYS"

Olvera Street, Los Angeles
Barbecue and Special Entertainment

WEDNESDAY, OCTOBER 26

10:15 A. M. FIFTH SESSION—HEALTH AND SAFETY

Chairman: William J. Coulter, Gen. Mgr., Climax Molybdenum Co.
Health Conservation of the Metal Miner
William B. Daly, Gen. Mgr., Anaconda Copper Mining Co.
The Silicosis "Racket"
James A. Caselton, Vice Pres. & Secy., St. Louis Smelting & Refining Co.
Accident Prevention Practice of Phelps Dodge Corp.
H. C. Henrie, Gen. Supt., Copper Queen Br., Mines Div., Phelps Dodge Corporation

2:15 P. M. SIXTH SESSION—PROSPECTS FOR THE METALS

Chairman: P. R. Bradley, Pres., Alaska Juneau Gold Mining Co.
Symposium—10-minute talks:
Lead—Stanly A. Easton, Pres., Bunker Hill & Sullivan Mng. & Concentrating Co.
Zinc—Howard I. Young, Pres., American Zinc, Lead & Smelting Co.
Copper—Kenneth C. Brownell, Vice Pres., American Smelting & Refining Co.
Iron Ore—R. C. Allen, Vice Pres., Oglebay, Norton & Co.
Gold—Herbert A. Sawin, Economist, Yuba Consolidated Gold Fields
Silver—R. M. Hardy, Pres., Sunshine Mining Co.
Other Metals and Industrial Minerals—Hon. John W. Finch, Director, U. S. Bureau of Mines
Gold, Silver and International Exchange
Hon. Key Pittman, U. S. Senator from Nevada

Evening open—an opportunity to "do the town."

THURSDAY, OCTOBER 27

10:15 A. M. SEVENTH SESSION—TAXATION

Chairman: Henry B. Fernald, Chairman, Executive Tax Committee, American Mining Congress
The Revenue Act of 1938
Granville S. Borden, Tax Counsel, San Francisco, Calif.
Federal Fiscal Policies
Ellsworth C. Alvord, Counsel, American Mining Congress
The Public's Interest in Mine Taxation
A. G. Mackenzie, Secy., Utah Chapter, American Mining Congress

12:15 P. M. JOINT LUNCHEON MEETING

Board of Governors, Western Division
Board of Directors, American Mining Congress
Moderne Room, Ambassador Hotel

2:15 P. M. EIGHTH SESSION—LABOR

Chairman: D. D. Moffat, Vice Pres., Utah Copper Company
Labor Relations at Home and Abroad
Hon. Edward R. Burke, U. S. Senator from Nebraska
Federal Wage-Hour Law—Application to Mining
A representative of Wage-Hour Division, U. S. Dept. of Labor
Report of Resolutions Committee

6:30 P. M. ANNUAL DINNER

Cocoanut Grove, Ambassador Hotel
Toastmaster: Harvey S. Mudd, Pres., Pacific Alkali Co. and Cyprus Mines Corp.
Address: Cornelius F. Kelley, Pres., Anaconda Copper Mining Co.

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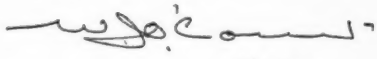
Are YOU going to the Mining Congress meeting at Los Angeles, October 24 to 27, 1938? I am, because I want to visit with old friends, and obtain the views of the leading executives of the mining industry—to see the worthwhile exhibits, and to play a bit in the country's perfect playground—California. I hope to see you there.



Manager,
American Smelting & Refining Co.

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set to swing time, will have to go elsewhere to enjoy their antics, for we can guarantee that Wayne King will not accommodate them.

Varied Field Trips for Closing Days

A program of interest-compelling and educational field excursions for Friday and Saturday, October 28 and 29, that are sure to meet with enthusiastic approval by the delegates, has been arranged by the Excursions Committee under the direction of E. O. Slater.

On Friday there will be a trip to the Mojave mining district, with visits to the Golden Queen and Cactus Queen mills and surface plants. The Golden Queen mill is now handling about 500 tons of ore per day, and the Cactus mill (shown in its desert setting on page 59) is operating at its present capacity of about 130 tons per day. Both plants are modern and up to date in every particular of method of operation and equipment. Following their relatively recent discovery, these properties quickly developed into gold producers of wide renown.

On Saturday there will be five optional trips as follows: (1) Riverside Cement Company limestone mine, (2) San Jacinto tunnel of the Metropolitan Water District of Southern California, (3) Atolia Mining Company's mill and the Yellow Aster mill, both in the Atolia-Randsburg district about 150 miles from Los Angeles, (4) Los Angeles harbor and (5) Mt. Wilson Observatory (this can be made most advantageously Friday afternoon and evening).

The trip to the Riverside Cement Company's limestone mine will afford the limited number of guests making this trip the opportunity of seeing a unique method of limestone mining, where caving methods are employed to mine cubes of rock as large as 200 feet on each side.

JULIAN D. CONOVER
Secretary
American Mining Congress

JAS. F. CALLBREATH
Secretary Emeritus
American Mining Congress

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NOTICE TO FOOTBALL FANS

Delegates who follow the pigskin parade at all closely will be interested in the following two games to be played in the Olympic Stadium in Los Angeles. The University of California at Los Angeles (U. C. L. A.) plays the University of Idaho on October 22, and Stanford University on the 29th. Both of these should be thrilling contests. Applications for tickets may be mailed at once to H. W. Howe, Edison Building, Los Angeles.

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Those taking the trip to the San Jacinto tunnel will see at first hand the methods of excavation, of handling a large amount of surplus water, of ventilation and of concrete lining this 16-ft. circular bore of 13 miles through the San Jacinto mountains about 80 miles from Los Angeles.

The Atolia Mining Company's mill, one of the largest handling scheelite ore in the country, has been operated off and on for over 20 years. The Yellow Aster mill, handling approximately a thousand tons of tailings per day from the old Yellow Aster mine workings, is particularly interesting because of the methods of handling and treating this low grade material.

The Los Angeles harbor trip will be made on boats, and will afford those taking it the opportunity of seeing the docks, loading facilities, the refinery of the Pacific Coast Borax Company, together with a great variety of shipping facilities in this busy port.

Those interested in star-gazing will find the Mt. Wilson trip of unusual pleasure. Situated only about 25 miles from Los Angeles, the 100-inch telescope at the Mt. Wilson Observatory will open up new vistas of heavenly wonders to those who make this trip Friday evening. By advance arrangements, those wishing may remain on the mountain all night at the hotel or in the many cottages available.

Special Fun for the Ladies

A special program of entertainment is being worked up for the ever increasing number of ladies accompanying their husbands to these meetings. Mrs. Harvey S. Mudd is directing these activities. Los Angeles literally teems with attractions that appeal particularly to feminine fancies, and there will be no dull moments for "the better halves" during the daytime. Details will be announced at the meeting.

Exposition to Draw Interest

Modern equipment and supply pieces running the gamut of the entire mining and milling operation will be displayed by prominent national and local manufacturers at the Exposition, which constitutes a most important integral part of the annual meeting. Visitors are afforded the unique opportunity of viewing at a central location the latest innovations in the thousand and one mining equipment and supply items, both large and small, that are

so necessary to continued progress in efficient operations. Y. D. Hills heads the Exhibits Committee that has completed arrangements to transform the beautiful Fiesta, Spanish and Colonial rooms of the Ambassador Hotel into a veritable parade of all that is new in mining machinery, including such items as locomotives, mine cars, loading machines, hoists, pumps, wire rope, ventilating equipment, rock drills, explosives, lubricants, crushing and grinding equipment, flotation machinery, safety appliances, etc. Over and above the educational value of the exhibit from a physical standpoint is the opportunity afforded all those interested in improving operating methods and results, to talk over with experts in the various equipment and supply lines the perplexing difficulties encountered in their operations, and to avail themselves of the technical assistance that is so gladly offered.

Manufacturers have spent generously of time and money in developing the exposition into a real drawing card, and guests will need no urging to take full advantage of the opportunity thus afforded, to view each and every exhibit and talk to the manufacturer's representatives.

Exhibitors to date include the following:

Allen-Sherman-Hoff Company
Alloy Steel & Metals Company
American Air Filter Co., Inc.
American Brass Company
Anaconda Copper Mining Company
Anaconda Wire & Cable Company
Arizona State Exhibit
Atkin & McRae
Atlas Powder Company
Baverstock & Payne
Bethlehem Steel Company
Bucyrus-Erie Company
E. D. Bullard Company
California State Exhibit
California Testing Laboratories, Inc.
Cochise Rock Drill Mfg. Company
The Dorr Company, Inc.
E. I. du Pont de Nemours & Co., Inc.
Thomas A. Edison, Inc.
The Electric Storage Battery Company
Engineering & Mining Journal
Fairchild Aerial Surveys, Inc.
Garlinghouse Bros.
General Electric Company
Goodman Mfg. Company
Hercules Powder Company
John Herman
Independent Pneumatic Tool Company
International Harvester Co., Inc.
Jeffrey Mfg. Company
Kansas City Structural Steel Company
Keuffel & Esser Company
Link-Belt Company

ROY L. COX
Chairman
Manufacturers' Division

L. W. SHUGG
Director of Exhibits
—Courtesy General Electric Co.

E. J. Longyear Company
Los Angeles By-Products Company
Los Angeles Steel Castings Company
Los Angeles Testing Laboratory
The Marion Steam Shovel Company
Mancha Storage Battery Loco. Co.
Meco Assayers
Metallizing Company of America, Inc.
Mine Safety Appliances Company
Mining Congress Journal
Montana State Exhibit
Northern Blower Company
R. A. Perez Company
Phelps Dodge Corp.
Plomb Tool Company
Pomona Pump Company
John A. Roebling's Sons Company
Sandvik Steel, Inc.
Sauerman Bros., Inc.
Smith-Emery Company
Smith Engineering Works
Southwestern Engineering Co.
Standard Oil Company of California
Stephens-Adamson Mfg. Company
St. Louis Power Shovel Company
The Texas Company
The Timken Roller Bearing Company
Traylor Engineering & Mfg. Company
U. S. Bureau of Mines
Utah State Exhibit
Western Cartridge Company
Western Machinery Company
Western Precipitation Corp.
Westinghouse Elec. & Mfg. Company

L. W. Shugg is again performing fine assistance as director of exhibits, through the courtesy of the General Electric Company.

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The metal mining industry is beset by so many important problems at the present time that it seems particularly appropriate that the Annual Metal Mining Convention and Exposition of the Western Division of the American Mining Congress is to be held in Los Angeles in October for a thorough discussion of these problems. These Mining Congress conventions afford a wonderful opportunity to mining men to hear good papers and join in the discussion of them; to see a splendid and up-to-date lot of mining equipment exhibits; and to join in all the sociability and good will that makes these annual conventions such a success.

P. G. Beckett
Vice President,
Phelps Dodge Corporation.

Scenic Attractions

Sightseeing opportunities in the region nearby Los Angeles are of wide renown. Towering mountains of the coast ranges lift their hoary heads above vast orange groves nestled along the coastal plain; the attractive beauties of Catalina Island are but a short boat trip from Los Angeles; Hollywood, with its kleig lights and glamor, is just around the corner; the breathtaking beauties of Yosemite, Death Valley and Sequoia National Parks are within easy striking distance while going to or returning from the meeting; and the Mother Lode, the vast gold placers of the inland valleys, and the world-renowned Arizona copper deposits are easily accessible.

Attendance at these meetings thus affords a splendid opportunity to combine business and pleasure. Come to the "playground of the West" October 24 to 27 and enjoy the kingly bill of fare that awaits you!

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NEED of EFFECTIVE ORGANIZATION of the MINING INDUSTRY*

● *Arizona Mining Men Urged to Maintain a United Front*

By JULIAN D. CONOVER
Secretary
American Mining Congress

MINING men throughout the country have been watching the formation of the Arizona Small Mine Operators Association with a great deal of interest, and I may also say with a great deal of pleasure. Here in one of our most important mining States, you are developing a fine, strong, militant organization — one that not only can do a great deal for its own members, but also, through working with other mining organizations, can be a powerful influence for good in the many national and regional problems with which our industry has to deal. Organization, cooperation and unity of action are vitally needed today. The voice of the individual may be weak, but when thousands of us get together, we can make a mighty potent chorus.

Back in the days of the old stage-coaches, there was a driver on one of the stages who was a great expert with his long black whip. He could curl the tip of the whip around a pebble or a chip of wood alongside the road, or cut off a leaf or a flower, or flick a horse-fly from behind one of the horse's ears without the horse even knowing anything had happened. One day a passenger on the seat beside him was admiring his skill, and finally he wrapped the end of his whip right around a chipmunk and tossed it in the air. Then they passed a hornets' nest, and the passenger asked, "Why don't you take a shot at those fellows?" "Nothing doing," said the driver. "*Them* fellows are organized."

We are glad to know that the small mine operators of Arizona have decided to follow the example of the hornets—that you've made up your minds to organize and fight for your rights, to see that the mining industry gets fair treatment and that it isn't burdened with taxes, regulations or restrictions that it can't stand. We want to congratulate you on the progress you have made in this first year, and we are confident your organization will continue to grow and carry further this fine work that means so much to the future of the industry.

* Address delivered before First Annual Meeting of the Arizona Small Mine Operators Association, Prescott, Ariz., August 27, 1938.

Important Place of Small Mine Operators

In the work of our organization in Washington and throughout the country, we see a great deal of the small mine operators—in fact, they constitute a majority of the membership of the American Mining Congress. I don't need to tell you that the small mine operators are in many ways the real backbone of the industry. Most of our big mines were small mines at one time, and it is to the prospector and the small mine operator that our country must still look for the continuance of the mining industry, for the discovery and development of new mines which will take the place of some of our large producers when their ore is exhausted and they reach the end of the road that all mines come to some day. It was the pioneer spirit, the faith and dogged determination of the prospector and small mine operator that built the West, and it is this same spirit that we need today if mining is to continue to supply the minerals and metals that have made us the greatest Nation in the world.

Unique Problems of Mining Industry

To men who have followed mining it is hardly necessary to state that our industry has its own special and peculiar problems, which are often vastly different from those of other industries; but, unfortunately, some of those who are charged with the writing or administration of our laws have all too meager a knowledge of these problems. Certainly mining in our Western mountains has little in common with the "sweatshop" factories of the East. As an industry engaged in finding and recovering our hidden mineral resources, with all the hardships and risks that accompany such efforts; as an industry which in its operations is depleting its capital with every ton of ore or pound of metal extracted, and where every unit of product sold must repay a portion of the investment if the enterprise is to be successful; and finally, as an industry which goes into the deserts and the mountains and creates new wealth, new payrolls, new communities and new markets which did not exist before, mining has its own special and distinctive characteristics, and it is highly important that these be recognized in determining public policies which affect this great industry.

If these problems of mining are to receive adequate attention; if the industry is not to be hamstrung by unnecessary regulation or excessive taxation, it must be organized, it must have the facilities for making its needs known to our public officials. The mining industry in this State, in other States and throughout the Nation must make itself heard; it must plead its case fairly and adequately with those who make and administer our laws.

Certainly mining, as one of our two great basic wealth-producing industries, has a right to expect full consideration at the hands of our government. Minerals form the source of half of the Nation's wealth. Mining

employs, in production and processing, 1,700,000 persons; and some 25,000,000 of our people are directly or indirectly dependent upon the industry for their livelihood. The average annual value of minerals produced in this country is 4½-billion dollars. Mining furnishes 55 per cent of the total freight revenue of the railroads. It is a substantial industry in practically every State of the Union and in two-thirds of the 3,071 counties of the United States. Throughout the West, mining creates one of the most important markets for the products of the farm and the range. Above all the mining industry brings forth new wealth which did not previously exist, and supplies the metals and fuels without which our present-day civilization would be impossible.

Organization and Functions of American Mining Congress

As an organization dedicated to the protection and advancement of this great industry, the American Mining Congress has a deep responsibility, both to the mining men of this country and to our national government.

The American Mining Congress was organized in Denver in 1898, just 40 years ago,—and before saying anything further, I want to pay tribute to the man who for most of those 40 years put his whole splendid energies into its work, a man whom many of you know and love—James F. Callbreath. Mr. Callbreath is now taking a well-earned rest at his ranch in Colorado, but his spirit and example are a constant inspiration in our work.

The first organization was a Gold Mining Congress, but almost immediately it was realized that most of the major problems of the various branches of mining are identical, and that it was essential to have a common organization for the mining industry as a whole. Accordingly, an organization of broad scope was formed, and headquarters were established in Washington. There the American Mining Congress has served for many years as a national clearing house for mining—interpreting the industry's needs to officials of our government, and keeping mining men constantly advised of developments which may affect them.

The membership of the American Mining Congress comprises producers of nearly all the principal minerals—gold, silver, iron ore, copper, lead, zinc, bituminous coal, anthracite, tungsten, mercury, antimony, molybdenum, vanadium, potash, sulphur, phosphate, etc. It includes both small and large producers—individuals, companies, and associations—with every member on an equal footing regardless of the size of his operation. The majority of the members are individuals and small mine operators.

With this nation-wide membership, the American Mining Congress is in a strong position to represent the industry before the committees of Congress and the numerous government agencies whose activities affect mining. Frequently it is called upon by these bodies to supply up-to-the-minute information on mining matters which will help them in deciding policies. It keeps in close touch with Congress and the government depaartments, advises mining men promptly of pending legislation or administrative action, determines the viewpoint of the industry, and seeks in every proper way to secure constructive legislation, or to protect the industry from undue burdens.

Although an aggressive fighting organization where the interests of mining are involved, the American Mining Congress maintains a strictly nonpartisan position. It deals with statistics, facts, and arguments based on definite information and knowledge of mining—not with partisan politics.

Present Conditions Require National Organization

Today, the need of a national mining organization is accentuated by reason of the increasing complexity of our Federal government, and the many new threats to mining enterprise that are constantly arising. Usually the small mine operator, the man who is trying to meet his payroll, has his hands so full with his own problems that he has neither the time nor the facilities to keep track of all that is transpiring in Washington. A new law or regulation that would add to his troubles or even force him to shut down could be enacted before he even heard of it.

To see that he is forewarned and in a position to express himself is one of the functions of his national organization. Every bill or resolution that is introduced in Congress—and there were over 17,000 of these in the 75th or latest Congress—is studied in our office and an analysis mailed to the industry of all those of special interest to mining. The current status of each is covered regularly in bulletins, letters, and telegrams. Thus, mining men and associations throughout the country are kept posted and are able to reinforce our representations in Washington with vigorous statements of their own views.

It would be quite impossible to discuss all the laws affecting mining that were proposed in Washington last year; but there are several matters of particular importance in which I feel sure you are interested.

Taxation

First, as to taxation. In the last seven years we have had six new Revenue Acts, plus the Social Security Act which is probably the biggest tax law of all time. With a new income tax law practically every year, and each one seemingly more complicated than the one before, no wonder the small mine operator is at a loss to know where he stands.

Two years ago he received a body blow when the tax on undistributed earnings was passed. This provided that if he used all or any part of the earnings from his mine for development work, for the purchase of machinery, for mill construction or for payment on his obligations, instead of paying these earnings out to the shareholders, he would be penalized by an extra tax of as high as 27 per cent, in addition to his normal income tax. Now we all know that most of the good mines of this country have been built into real producers—and employers of labor—out of their own earnings, by using the profits from operations for new equipment and further development. To impose a penalty tax of this sort simply because, as a matter of sound policy, earnings are used to build up the property instead of being handed over immediately to the share-holder, plays havoc with the small mine operator, and increases the cost of development and equipment to a prohibitive extent. Also, with such an obstacle to face, the flow of capital into mining enterprises is going to be extremely slow. We protested the whole principle of such a tax before committees of both the House and the Senate, but after long debate it was finally enacted. Not until mining men made out their tax returns for 1936 did many of them realize just what this tax meant, and the storm of protest which arose, both from our own industry and from all other lines of business, was so strong that the whole matter was reconsidered in this last session of Congress when all but a vestige of the tax was removed.

There is another change in this year's tax law which is of great importance to the small mine operators, particularly those who require capital

for financing their properties. This is the revision of the tax on capital gains which was advocated by the American Mining Congress. The new law eliminates the complicated provisions under which capital gains were taxed at such high rates as to freeze invested capital, and substitutes a series of moderate flat rates which are already acting to release capital for new ventures.

Right Secured to Redeclare Capital Stock Values

Operators of small mining properties, especially those in the development stage, are also deeply concerned with another change in the tax law, advocated by the Mining Congress for several years and finally made effective this year. This permits a mining company to make a new declaration of the value of its capital stock in 1938 and every three years thereafter, and to pay its capital stock tax on the basis of the new declaration. We all know only too well how the value of a mining property may vary—how greatly it may increase with a new discovery or decrease with a pinching out of the ore. Under previous laws there was no provision for declaring a new valuation to meet such changes in conditions, and this frequently caused distinct hardship and injustice to mining concerns.

Take, for example, the case of a property just being developed, with no ore in sight. The owner of such a property would naturally declare a low value, and pay a small capital stock tax in keeping with its lack of earning power. If a good ore body was struck and the operation began to make a profit, its value would increase materially; but if its earnings, figured on the law capital-stock valuation, exceeded 6 per cent, the owner became liable for a heavy excess profits tax on everything above that. He was not given the right to declare a new value in keeping with the new conditions.

On the other hand, take the case of an operating mine making good earnings. Such a property would also declare a capital stock value in keeping with its earning performance, and high enough to prevent its being subject to a confiscatory excess profits tax. Now suppose the ore pinched out and became non-commercial, or a fault were encountered, or any of the other hundred-and-one things happened that may cut a mine's earning power. Not having the right to declare a new value in keeping with these new conditions, the owner of the mine would be "stuck" with the old high valuation, and would have to pay an excessive amount of capital stock tax even though operating at a loss.

Without the right to re-declare, the mine operator had to gamble on what his property would do over a long period of time. If he guessed wrong, as was commonly the case, he was effectively whip-sawed between a confiscatory excess profits tax on the one hand, or an excessive capital stock tax on the other. The only fair and proper answer to his dilemma was to give him the right to make a new declaration at frequent intervals, and we are very happy that this has finally been secured. We do feel, however, that this right should be accorded every year or every two years at the most, and we are confident that our western Senators and Congressmen who understand the mining industry, and who have done so much to bring about this change, will support this view.

I am discussing taxes at some length, but I am sure you will agree that they are one of the very biggest problems that worry the small mine operator today; and as we look ahead and consider the 9-billion-dollar-a-year cost of our Federal Government, and the all-time peak national debt of 38½-billion dollars with further increases in sight, even though approximately a billion dollars of Social Security taxes is being applied annually against ordinary current expenses of running the Government, we can foresee that the demand for revenue is going to be extremely heavy and that taxes are likely to be an even greater problem in the coming years.

Provision for Depletion Deduction Preserved

There was another controversy over a particular provision of the income tax law which was extremely serious to mining. I refer to the deduction for depletion. Under the existing provisions of the income tax laws, metal mines are accorded the right, in determining net taxable earnings, to deduct 15 per cent of the gross income of the property as an allowance for the depletion of their ore bodies. Last summer, the Secretary of the Treasury made a direct attack upon this provision and urged that Congress abolish this right.

Now, of course, the depletion deduction is merely the recognition of what I mentioned previously, that the ore in the ground is the miner's capital and that he is using up a portion of that capital with every ton extracted; consequently, whatever operating profit he realizes from the sale of that ore is not a true profit, but a substantial portion of it represents simply the return of his capital. The depletion deduction protects the miner against taxation of his capital.

The percentage basis, which was secured through the efforts of the American Mining Congress in 1932, afforded a simple means of computing that allowance, without all the complications and technicalities that had previously existed. It was primarily designed to benefit the small mine operator, who did not have all the engineering, accounting and legal services that were needed to establish his rights; and it was this feature of the law that the Treasury urged Congress to abolish.

Obviously this issue was so critical that it required the strongest possible action by those interested in the mining industry's welfare and future prosperity. Following urgent representations to the proper committee consideration was deferred to the 1938 tax

bill. In the meantime we communicated the facts at issue to every mining area in the country, and distributed many thousands of copies of a pamphlet answering the attack on percentage depletion and giving in concise form the complete justification for this provision. With this material in hand, mining men and mining associations throughout the country communicated personally with their Congressmen and Senators, pointing out the menace of the Treasury's proposal; and as a result of this unified and coordinated protest, in which it was clearly evident that the position of the American Mining Congress represented that of the entire mining industry, no change in the existing depletion provision was made in either House of Congress.

Wages and Hours Legislation

So much for taxes. I know you are also very much concerned over the efforts, even before the days of the N.R.A., towards Federal regulation of wages and hours of work in all lines of industry. For several years the universal 6-hour day and 30-hour week were urgently proposed, and continued vigilance was required in opposing this visionary plan. Finally, at this last session, Congress enacted a national wage-hour law, which will go into effect on October 24 of this year.

As you probably know, this provides a minimum wage of 25 cents an hour, going up in steps to 40 cents after seven years, or earlier where recommendations are made by industry committees. With this provision we are not particularly cencerned; the mining industry has never worked under "sweatshop" conditions, and has paid the highest wages consistent with the price of its products.

The law also provides a maximum 44-hour week, decreasing to 42 hours the second year, and to 40 hours after that. These limits are fixed by the law and cannot be changed by the industry committees. Additional hours may be worked on payment of time and a half.

These maximum hour provisions are of deep concern to our industry and when it became evident that a bill would be enacted in spite of opposition, we tried strenuously to have it modified to meet the conditions which exist in mining. Your own excellent publication, "Pay Dirt", has referred to this situation at some length. We proposed the averaging of these maximum weekly hours over a 6-months' period, to allow the flexibility required in mining and to permit continuous operation and employment in isolated communities. The final law does contain an averaging provision allowing 1,000 hours of work over a six-months period, but unfortunately it is made contingent upon agreements with collective bargaining representatives who must be certified by the National Labor Relations Board. With this additional red tape, and with the administration of the Act thus divided between two entirely separate agencies—the Wage-Hour Division of the Department of Labor and the National Labor Relations Board—the efficacy and usefulness of this feature is accordingly diminished.

I do want to call your attention to one feature of the wage-hour bill as it was reported by the House Labor Committee a year ago. That bill required the payment of time and a half for work done between midnight and 6 a. m., in other words on the "graveyard" shift. Such a provision would have created intolerable confusion and extra burdens for the mining industry. It was brought to the attention of the western Congressmen, and through their efforts, an agreement was reached with the Labor Committee under which this provision was stricken from the bill when it reached the floor. Here again we had the pleasure of working closely with our Congressmen from the West, and prepared a thorough statement of the harm which the "graveyard" shift provision would do to mining, which they used to excellent advantage in making their protest to the Labor Committee.

I have just referred to the National Labor Relations Board which has been brought into the administration of the wage-hour law. This Board, in its administration of the National Labor Relations Act in the past three years, has created extreme difficulties for both employers and employes, in mining and industrial enterprises of all kinds. Misunderstanding and friction have been engendered between the workmen and management of properties, where relations had over a long period of time been based upon mutual cooperation and regard for the success of the enterprise. Mine operators, both small and large, have been subjected to needless trouble and expense and loss of production.

I do not need to enlarge on this subject, except to point out the urgent importance of securing modifications in the existing law. The act should be amended to provide that employes shall be free from coercion or intimidation *from any source*, including outside labor organizers; to require that labor organizations as well as employers observe and comply with collective bargaining agreements; to give employers the right to call for elections of employe representatives, and to curtail the arbitrary powers of the board which is now investigator, plaintiff, judge and jury rolled into one.

Certainly any fair-minded man will agree that such provisions are just, and should be included in any law designed to improve labor relations and bring industrial peace. Sentiment for such changes is growing, and it appears that they will be subjected to intensive debate in the coming session of Congress. One of the champions of these urgently needed amendments, Senator Edward R. Burke of Nebraska, will address our forthcoming convention in Los Angeles.

Threat of Tariff Reductions

The mining industry is today faced with the possibility of reductions in the moderate tariff protection afforded to lead, zinc, tungsten and other metals, under the pending trade agreements with Canada and Great Britain. These minerals were included in the list of commodities subject to negotiation, on which reductions of as much as 50 per cent in existing duties may be made, which would then apply automatically to Mexico and other countries under the "most favored nation" principle.

This was one of the first subjects on which we communicated with your association immediately after it was organized last winter. We suggested to you and to associations in each of the other producing States, a prompt and vigorous protest against any cut in present duties. The response was excellent; here in Arizona your own organization, your Governor, your Senators and your Congressman all laid before the State Department and the National Congress, the danger to production, payrolls and employment that impends if the bars are let down to the more cheaply produced minerals of Canada and Mexico. With similar action from other States and appearances at the public hearings on the proposed treaties, the facts have now been fully presented.

Concern Over Public Land Policy

The public land policies of our Government are another matter of deep concern to the mining industry of the

West. The established system of locating metalliferous mining claims and granting patents, under which the prospector is entitled to the fruits of his toil, and initiative and enterprise are encouraged, has recently been publicly questioned in high places, and it has been suggested that a leasing system similar to that for coal, oil and gas, potash, phosphates and sulphur be substituted. We are definitely opposed to such a change.

Restrictions on mining development in the National Game Preserves and other public lands, and withdrawal of such lands from mineral entry, are another bar to legitimate mining activity, which is of real concern to the small mine operators of Arizona and other Federal Domain States, and on which it is important that their position be clearly stated to their representatives in Washington.

Work for Modified S.E.C. Regulations

In recent years one of the greatest handicaps to mining enterprise has been the difficulties in financing new explorations and developments under the operation of the Securities and Exchange Act. We all know that the development of mining prospects is by its very nature a speculative enterprise, in which capital must be risked for the hope of large ultimate returns. We hold no brief for the unscrupulous promoter of fraudulent mining securities, who has done untold harm to our industry, and we recognize the need of protecting the investing public against dishonesty. Unfortunately, however, the Securities and Exchange Act in its administration has seemed to go much further, and to hamper and in many cases prevent the financing of legitimate mining ventures in which the investor was offered a real run for his money. The elaborate information forms, the delays and expense in registering mining securities have been the subject of widespread criticism, and in many cases have brought almost to a standstill the development of new mining properties upon which the future of our industry depends.

Recently our Board of Directors appointed a special Committee for Cooperation with the S.E.C., to study this situation and recommend corrective action. This Committee will report at our Los Angeles meeting in October, and there will be a full discussion of this problem and how to overcome the difficulties which it now creates for the small mine operator.

These are just a few highlights of some of the national problems in which we are all so much concerned. I think you will agree that these problems call for the best thought of the whole industry. We are delighted that you are giving attention to them today, and we feel that they should be further considered in open meeting by mining men from all parts of the country and a definite policy and course of action decided upon.

Editor's Note: Mr. Conover then extended a cordial invitation to all mining men of Arizona and her sister States to attend the 5th Annual Metal Mining Convention and Exposition of the Western Division, American Mining Congress, in Los Angeles, Calif., October 24-27. Detailed information on the program, exposition and entertainment features appear elsewhere in this issue.

Entry Driving at New Orient

(*Continued from page 46*)

these conditions is materially reduced.

Other Major Advantages

There are a number of major advantages from the use of these machines other than those already mentioned. The straight, smooth ribs and top left by the machines offer much lower resistance to the flow of air than irregular surfaces resulting from other development methods. The coal produced shows a higher percentage of plus 2 in. than is obtained from regular machine driven entries. The continuous straight rib lines and smooth top lend themselves to standardized methods of installation and more uniform alignment of track, trolley wire and power feed cables. Panel entries driven by these machines make it practical to work the panel territory by the retreat method.

The McKinlay entry drivers in use at New Orient are of an early design. The changes and improvements made on these units have all been incorporated in machines of more recent manufacture. A number of other improved features have been embodied in the later machines. The rotor bars have been made sectional to fold back and the chain guide supports can be telescoped. The overall dimensions of the machine have also been reduced. All of these improvements reduce time and expense in moving. Decreasing the length of the machine should facilitate driving of curves of a shorter radius which would be desirable in making panel turnouts.

There are also other points of design which would improve the performance of the machine, and which undoubtedly have been incorporated in the machines now being manufactured.

By careful manipulation, McKinlay machines may negotiate rather sharp curves. Above is a 100-ft. radius curve in entry driven by one of the machines. Straight, smooth ribs and top offer a minimum resistance to air flow

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

AMONG the 8 Senators and 40 odd Congressmen who will be missing next January, due to primaries, death and resignations, the defeat of Senator McAdoo by a "$30 every Thursday" campaigner was the most disturbing event. Far less possible of fulfillment than the early day slogan "40 acres and a mule", it was enough to lure voters away from a man prominent in public life for over 30 years. Nearly equalling this surprise was the hill-billy band and ten commandments campaign of the Governor-elect of Texas who, when assailed by hecklers, called to his band, "Give them a little more music boys!"—and then switched to another topic.

Millard Tydings, of Maryland; Walter George, of Georgia, Ellison Smith, of South Carolina; Pat McCarran, of Nevada—all were opposed by administration forces in their primary campaigns, and all were successful in winning their way back to the Senate. It is true that John O'Connor, from New York, the House Rules Committee chairman who opposed the Governmental Reorganization and Wage-Hour Bills, will not come back to his chairmanship, but neither will Senator Pope, of Idaho, answer to the roll-call next January. The division which exists in the majority party will be much in evidence in the coming Congress, and members will be much more prone to vote on legislative measures according to expressed desires of their supporters in the home states and districts.

Taxation

In the Treasury Department Undersecretary Roswell Magill has practically completed his studies of revenue measures, sources and procedure prior to his return to Columbia University. His successor is Assistant Secretary John Hanes, who has been brought over to the Treasury from the Securities and Exchange Commission. Much of the work on revenue matters handled in the past by Roswell Magill will now fall on the shoulders of Mr. Thomas Tarleau, legislative counsel for the Treasury for the past two years. As matters now stand, the Ways and Means Subcommittee, under the probable chairmanship of Representative Jere Cooper, of Tennessee, will not take up the studies preparatory to development of the Revenue Bill of 1939 until after the November elections. Incidentally there are now five vacancies on the majority side of the Ways and Means Committee of the House, since Morgan G. Sanders, of Texas; David J. Lewis, of Maryland; Fred M. Vinson, of Kentucky; Claude A. Fuller, of Arkansas; and Otha D. Wearin, of Iowa, will not return. Identity of those who will replace these vacancies cannot be known until the Democratic caucus of the House of Representatives makes its selections; but it is greatly to be hoped that at least one Representative from a mining State who thoroughly understands the problems of mining and of the marketing of metals may find a place on this important committee.

As the result of studies and conferences, in which Chairman Doughton, of the House Ways and Means Committee, and Chairman Harrison, of the Senate Finance Committee, have been in touch with the President and the Treasury, the program for the coming Revenue Bill is gradually taking form. At the present time it is believed that the excise taxes which expire on June 30, 1939, must be re-enacted and that consideration is to be given to: Taxing income from tax exempt securities; taxing Federal and State salaries; imposing processing taxes to cover agricultural benefits; passing additional payroll taxes to meet broader social security coverage, and changes in rates of corporation taxes.

Any serious attempt to restore the 1936 undistributed corporate earnings tax is considered unlikely because of the more self reliant attitude expected to prevail in the incoming Congress. Recommendations of the Treasury on corporation taxes are expected to follow the completion of the budget of 1940 and the announcement of revenue requirements to be presented to the Ways and Means Subcommittee at that time. A Senate Finance Subcommittee under Senator Herring, of Iowa, is making an investigation of profit-sharing plans which have been put into operation by about 2,000 corporations. This investigation was authorized by Senate Resolution No. 215, sponsored by Senator Vandenberg, of Michigan, who with Senator Herring has in mind the encouragement of profit-sharing with employes by setting up some form of tax exemption or reduction. It is announced that public hearings will be held by the Subcommittee in December.

Wage-Hour

Administrator Elmer F. Andrews, Wage-Hour Division, Department of Labor, has been proceeding carefully in developing an organization to put into effect the provisions of the Fair Labor Standards Act of 1938. Paul Sifton, of New York, has been named Deputy Administrator, and A. L. Fletcher, of North Carolina, is Assistant Administrator in charge of the compliance work under the act. Calvert Magruder, of the Harvard University Law School, has been appointed chief counsel. Mr. Magruder is understood to have a leave of absence from the university for one year. He was general counsel for the National Labor Relations Board in 1934 and 1935, and in earlier days (1916 and 1917) he was law secretary for Supreme Court Justice Brandeis. Assisting Mr. Magruder will be Rufus Poole, of Chicago, recently on the staff of the General Solicitor of the Department of the Interior.

In discussing the definition of "interstate commerce", a serious job fac-

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ing the new general counsel's office, Magruder said, "All that I could do would be to issue a release setting forth our guess as to what most nearly defines interstate commerce as referred to in the statute. If any promise was made that this office would make an interpretation or definition of interstate commerce, I must say that it cannot be done, certainly not this week. We are working on some sort of a blanket interpretation which will represent the opinion of this office but it will be only our own definition and will have no official status under law."

With an appropriation of $350,000 Administrator Andrews is proceeding carefully with the enormous work lying before him. This is in encouraging contrast to the rush that marked the inauguration of the work of the National Recovery Administration. One source of enforcement toward which Secretary of Labor Perkins and Administrator Andrews are looking is a series of State Fair Labor Standards Acts which are to be considered in October when the National Conference on Labor Legislation will meet in Washington. If such acts are passed by the various States in conformity with the requirements of the Federal Act, it will greatly simplify the work of the Wage-Hour Division.

In so far as mining operations are concerned, the chief interest of the industry lies in the provision which requires a 44-hour week effective for the year following October 24. Managers of mining properties wish to know which and how many of their employes are exempt from the hours provisions. As yet there is no answer to these questions from the Wage-Hour Division. It is anticipated that regulations will be issued early in October to serve as a guide for industrial managements, but Administrator Andrews has said that honest mistakes by an employer will not be penalized. However, he warned employers that under the act employes may bring suits and recover double damages plus counsel fees for unpaid overtime.

Labor Relations Act

The results of the study of British labor relations made by the President's Commission, including Charles R. Hook, Henry I. Harriman, Gerard Swope, Lloyd K. Garrison (chairman of the first board under the Wagner Act) and others, were made public in a 23-page report during the last week in August. No recommendations were included, and the President stated: "To many the most salient feature of it is the cooperative spirit coupled with restraint which is shown by those who represent both employers and employes in Great Britain. Collective bargaining is an accepted fact and because of this the machinery which carries it out is functioning." However, about the same time that the British labor report was issued, William Green, of the American Federation of Labor, was a visitor at Hyde Park, New York; it was reported that the President was in accord with the desires of the American Federation of Labor that the National Labor Relations Act be amended to provide for a more equitable treatment of the problems arising between all who are involved under the act. Later reports indicate the Administration has swung back to the position that the present act does not require change. The further comment has been made that the President is particularly friendly to the Labor Board, and that he frequently reads its reports on the disposal of labor disputes to representatives of the press attending his conferences. The report of the Commission on labor relations in Sweden has not yet been made public; a further angle is the study of similar nature in England and Sweden being made by Senator Edward R. Burke, of Nebraska. It is certain that there will be a strong effort in the coming Congress to amend the act so that both employer and employe may receive a proper judicial consideration in any controversy that is brought forward through recourse to the provisions of the act.

As previously announced, Senator Burke will address the Metal Mining Convention of the American Mining Congress in Los Angeles on October 27 shortly after his return from Europe, and it is to be anticipated that he will make a frank statement of the conditions and the related facts of the industrial situation in England and Sweden exactly as he found it.

Monopoly

During the past month the departmental agencies of the O'Mahoney Temporary Economic Committee have been correlating information in their possession, and the Securities and Exchange Commission has issued a questionnaire to insurance companies with a view to ascertaining the effect of their very large investments in railroad and other industrial enterprise. The Department of Commerce on September 26 issued a questionnaire to all trade associations asking complete information on their activities. One trade association executive, who has been functioning in a consulting capacity to the Department in the development of the questionnaire, undertook to fill it out as a trial test some 10 days before the final release. He reported that it required about two and one-half days to answer the questionnaire, and said that he considered his organization was typical of the average trade association.

Senator O'Mahoney has recently stated that public hearings before his committee will not be held until at least one of the departmental and congressional units which make up the membership of the committees has fully assembled the data available in their part of the field. He further stated that public hearings before methods and practices is an objective survey, and that there will be no improper treatment of witnesses before his committee.

Bituminous Coal

Efforts to arrive at the fixation of prices in Western and Eastern coal fields are occupying the front position in the work of the National Bituminous Coal Commission. Opinions differ as to the public date of price proclamations, but it is felt by many that it will be difficult indeed for the Commission to decide on the prices of Eastern coal before the first of the year. The battle over the announced intention to make public the cost data of individual mining properties continues. The Utah Fuel Company and 21 other coal producers secured an injunction on September 14 through the District of Columbia Court of Appeals which prevented individual cost data from being made public during the price hearings. The case will probably be heard in Washington on October 3. (Further details on page 74.)

In Harrisburg, Pa., the legislature has had under consideration a series of four bills for State control of the anthracite industry. These measures have resulted from the work of the Lauck Commission created to study the problems of anthracite, but it is not anticipated that there will be any final action taken by the legislature in the present session. A Federal Anthracite Control Bill introduced in the first session of the 75th Congress in 1937, lay dormant and died with the adjournment of Congress, June 16, 1938. In the meantime, some of the experiences of the bituminous coal industry are being repeated in the anthracite region—namely, reorganization of a few of the larger operations into numerous smaller producing units.

NEWS and VIEWS

Bingham Vehicular Tunnel Near Completion

Opening of the Bingham-Copperfield million dollar vehicular tunnel to traffic is expected by early November, according to recent reports from Bingham. Work at the tunnel is now in its final stages, with concrete being laid on the 4-ft. sidewalk covering a 3½-ft. concrete flume.

Preliminary work on the tunnel began in March, 1937, and by April of the same year the Utah Construction Company, which had been granted the contract by Utah Copper Company, began actual boring of the tunnel.

The tunnel will be turned over to Salt Lake County following its completion and a trial period. Maintenance cost will be borne by the Utah Copper Company. The tunnel will be 6,975 feet long, and traffic will be controlled by signal lights placed at both entrances and at two turnouts. Complete lighting of the tunnel has been provided for as an additional safety precaution.

Nellis Coal Holds Safety Meet

The annual meet of the safety teams of the Nellis Coal Corporation was held at Nellis, W. Va., August 27.

In what was termed by officials the most successful safety meet ever conducted by the company, first honors for teams for men were won by a team captained by Francis Dentremont; first place for the teams composed of boys was won by a team captained by John Keenan; and victor in the contest for girls' teams was one captained by Miss Mildred Wade.

Dinner was served at the company club house for officials of the company and a number of visitors including Al Quinn, secretary to Governor Holt; N. P. Rhinehart, chief of the State Bureau of Mines; Ralph Hartman of the state compensation department, and Clarence O. Morris, inspector in the Bureau of Mines, who was in charge of the safety contest.

Program for the meet was planned by C. W. Connor, superintendent of mines of the Nellis Company.

Comments on S.E.C. Registration Requirements

The American Mining Congress Committee on Cooperation with the S.E.C., which will render a report at the Metal Mining Convention in Los Angeles, has studied a large number of registrations ranging from small companies attempting to finance prospects to those of large concerns with securities listed on the stock exchanges and with underwritings amounting to millions of dollars. Complaints of one kind or another appear in most of the responses received, indicating the need of corrective action. Some of the comments most frequently occurring are as follows:

(1) More detailed instructions are required, not only as to making out the questionnaire but also as to how to respond to deficiency letters.

(2) There is a lack of uniformity in decisions where the case is handled by more than one person in the Commission. Various cases were cited where one official had reversed the decisions of another.

(3) Complaint is made of the lack of cooperation, and this is believed to refer particularly to a desire on the part of registrants that officials of the Commission should make suggestions as to how deficiencies might be cured. Some of the smaller registrants complain that local representatives of the S.E.C. refuse to advise in connection with preparation of their registration.

(4) Some of the questions are confusing and require additional questions or instruction as to treatment. Some of the things most frequently complained of include the requirement to state details of possible expenditures, cost of machinery, from whom to be purchased, etc., in advance of their actual purchase, the registrants pointing out that in a development enterprise the equipment required depends largely on the result of development from time to time.

(5) Complaint is general as to the cost of registration, and this is not limited to any class of registrant.

(6) There is much complaint as to the length of time required for preparation of the registration statement, prospectus, etc., and the time required to complete registration. Some of the larger registrants complained that this delay has resulted in inability to complete the proposed financing due to a change in market conditions between the time of starting preparation of application and the completion of registration.

(7) There are several instances in which complaint is made that the deficiency letters indicated that they were not prepared by one familiar with mining problems.

(8) A number of registrants declined to respond, stating that they feared retaliation on the part of the Commission. In one case, a response of this kind was made by a high government official.

In its report at the October meeting, the committee will consider all these as well as other complaints, and bring out various suggestions which it believes may improve the law and its administration.

New Member of Advisory Council, Coal Division, of the American Mining Congress

Charles Dorrance, vice president and general manager, Consolidation Coal Company, has accepted appointment as a member of the Advisory Council of the Coal Division, American Mining Congress. The Advisory Council consists of 21 coal executives, who consult and assist in the selection of the phases of mining to be studied, the general type of information to be gathered, and the nature of the reports to be published by the Coal Division. Mr. Dorrance's wide experience both in bituminous and anthracite mining will be of great assistance to the effective work of the Division.

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COAL COST DATA SECRECY ORDERED

THE District of Columbia Court of Appeals threw a monkey wrench into the price fixing machinery of the National Bituminous Coal Commission on September 14 when it issued an injunction in favor of the Utah Fuel Company and 21 other coal companies restraining the Commission from revealing individual cost data to interested parties who had filed intention to participate in the reopened cost hearings at Denver and Washington. The case reached the Appeals Court after District Court Justice Joseph W. Cox had sustained a motion of the Coal Commission to dismiss the bill for injunction brought against it by the 22 coal companies from Utah, West Virginia and Pennsylvania to prevent the Commission from making public their individual cost-producing data.

The Commission was to have opened the reports of Western producers for inspection at Denver on September 10, in preparation for holding the reopened cost hearing at Denver on September 20. Adhering to the court order, Chairman Percy Tetlow instructed F. W. McCullough, secretary of the Commission, to cancel all plans for revealing the cost data, and also refrain from reopening the scheduled cost hearings to permit cross-examination on the producers' reports.

Chairman Tetlow said: "The issue raised is an interesting one and inevitably had to be determined by the courts and in no way interferes with the present price hearings which are being conducted in Denver and which are to be followed by similar hearings in Washington for the Eastern, Middle Western and Southern areas. The Commission looks for an early adjudication of this matter, as I am informed this action has been given precedence over all other appeals before the Court of Appeals in Washington and undoubtedly will be heard during the first week of October. Our final argument will be presented at that time."

Denver Price Hearing

The Commission's hearing on the proposal of price relationships and differentials by the Rocky Mountain and Western States opened at Denver on September 14. Up to press time the Commission had heard representatives of Utah, Colorado, New Mexico, Arizona, and California present testimony on the proposed price relationships in the Rocky Mountain and West Coast States.

Competition of other fuels, particularly natural gas, was brought forcibly to the attention of the Commission by R. B. Griffith, field representative of the producers board for Northern Colorado. He stated that domestic consumers in Denver paid as high as 90 cents for the first 400 cubic feet of their gas while the same gas was being sold to industrial plants at as low as 9 cents per thousand cubic feet. Griffith said the gas was piped to Denver from the Texas panhandle, over 400 miles away, and had provided competition which had direct bearing on the bituminous coal industry of Northern Colorado.

Consumers' Counsel John Carson, through Allan Coe, his attorney, moved to strike from the record all prices proposed for Northern Colorado, and insisted that the Commission change its procedure in determining prices. In support of this motion consumers' counsel argued that the act required the District Boards to submit schedules of proposed minimum prices which would reflect the actual prices the boards ultimately expected to receive. He also argued that the evidence presented by District 16 (Northern Colorado) was insufficient in law and in fact to support its schedule of proposed price differentials.

Chairman Percy Tetlow stated from the bench in handing down the Commission's ruling denying the motion of consumers' counsel, that "the construction of Section 4, Part II (a) of the act, urged by the consumer's counsel has been previously advanced by him and the Commission gave the matter thorough consideration prior to this hearing. The Commission concluded that such a construction was inconsistent with the express provision of the act and was contrary to the intent of Congress as disclosed by the legislative history of the act, and furthermore such a construction is impractical and might lead to absurd results."

On September 20 the Commission announced that it would begin hearings on proposed minimum prices and marketing rules and regulations for the Appalachian region on October 10 at Washington, D. C. In this hearing, which will be followed by a final hearing before the promulgation of established prices, the Commission will receive evidence relating to the kinds, qualities and sizes of coal, classification of such coal, price variations as to mines, consuming market areas, values as to uses and seasonal demand, and as to whether or not such proposals conform, or should be modified so as to conform to the requirements of Subsection (a), Part II, Section 4 of the Bituminous Coal Act of 1937.

Robert Gregg, president of the Tennessee Coal, Iron and Railroad Company (extreme right) congratulates the men largely responsible for a safety performance which has won the "Sentinels of Safety" trophy for a second consecutive year. The bronze statuette, awarded annually by the United States Bureau of Mines in a national competition among non-metal mines, remains in the possession of employes of the T. C. I.'s No. 5 limestone mine at Muscoda for another year on the basis of their perfect record for 1937. Through Friday, September 16, the day the trophy was formally presented, the mine had operated 1,206 consecutive days without an accident requiring loss of time. Left to right: Hugh Stewart; W. C. Clark; Dewey Baker; Clay Armstrong; W. P. Fountain; Tom Oglesby; Earl Roberson; E. L. Nivens; Ewing Carter, superintendent; E. M. Ball, general superintendent of ore mines and quarries; and Mr. Gregg

Safety Meet at Omar

Approximately 4,000 people witnessed the spirited competition between members of mine safety teams of the West Virginia Coal and Coke Corporation in a safety day and first-aid demonstration held at Omar, W. Va., September 17.

Addressing the throngs of miners and their families were Col. R. W. Lee, of Cincinnati, president of the company; A. G. Matthews, state compensation commissioner; and William Blizzard, vice president of District 17, United Mine Workers.

First honors for white miners in the contest were won by the electrical department of the company at Omar, with W. A. Wood as captain.

Clarence O. Morris, state mine inspector, was chief judge of the contest. After the judging, a dinner was served and a dance held in the Omar clubhouse of the company in honor of the judges, visitors and officials of the company.

BOOK REVIEW

MINERALS YEARBOOK 1938.

United States Department of the Interior, Bureau of Mines. Compiled under the supervision of H. Herbert Hughes, Economics and Statistics Branch. 1,339 pages. For sale by Superintendent of Documents, Washington, D. C. Price $2.00.

THIS economic and statistical review of developments in the mineral industry in 1937 constitutes another complete and authoritative chapter in the unbroken record of annual governmental reports begun in 1880. Efforts since 1932 to speed up publication of the data and yet include a maximum of final figures have reached a new high in the 1938 volume, with more final data for the year reviewed than any earlier volume of the Yearbook series.

The 1,339 pages and 70 chapters are divided into four parts: (1) Survey of the mineral industries, (2) Metals, (3) Nonmetals, and (4) Mine safety.

The first part comprises two chapters presenting a statistical summary and a review of world production and economic aspects of international mineral policies. Efforts of Germany, Italy and Japan to meet their mineral-deficiency problems are dealt with in considerable detail.

The second part consists of 19 chapters reviewing pertinent information on major and minor metals and 15 chapters presenting statistics and important developments in the nonferrous metal mining industries of the major producing states. Graphs show the history of production in the principal western states. Timely and pertinent data concerning the lead and zinc tariffs, including history, effectiveness, and summary of grade of ore mined in principal lead and zinc-producing regions of the world, are given, with the general conclusion in both cases that domestic producers would be handicapped in competing with other important world producers because of relatively low grade of ore.

Part three comprises 32 chapters describing nonmetals, including fuels. Continuity of the published record on bituminous coal was made possible through the cooperation of the National Bituminous Coal Commission in preparing a chapter for inclusion in the volume.

Part four consists of one chapter discussing employment and accidents in the mineral industries.

Prepared by 57 authors, all of whom are experts in their respective fields, the volume is an indispensable reference for all members and students of the mineral industry.

PUBLICATIONS of INTEREST

U. S. BUREAU OF MINES

Bull. 402. CRUSHING AND GRINDING, by John Gross. 148 pp. 66 figs. 25 cents. Discusses the theory of crushing and grinding in relation to present-day discoveries and developments, and describes the various mechanical appliances from a theoretical basis.

Bull. 405. COPPER MINING IN NORTH AMERICA, by E. D. Gardner, C. H. Johnson and B. S. Butler. 300 pp. 92 figs. 40 cents. Summarizes a wealth of subjects relating to the copper industry in North America, presenting production of mines and districts, history of the industry, geology of the principal deposits, and mining methods and costs. The principal copper mines of the continent are listed and pertinent data regarding their operations are tabulated; methods are illustrated by descriptions of practices at typical mines.

T. P. 586. NOTES ON THE SAMPLING AND ANALYSIS OF COAL, by A. C. Fieldner and W. A. Selvig. 48 pp. 6 figs. 10 cents.

R. I. 3411. TESTS OF A BARRIER USING ROCK DUST IN PAPER BAGS, by H. P. Greenwald and H. S. Howarth. 16 pp. 10 figs. Describes the bag barrier in detail, and presents results of exhaustive tests made on it. Concludes that the bag barrier is doubtless cheaper to install and maintain than those recommended in Bull. 353, but the financial advantage is accompanied by a loss of efficiency against weak explosions resulting from poorer dispersion of the rock dust in the barrier.

I. C. 7022. RECONNAISSANCE OF MINING DISTRICTS IN EUREKA COUNTY, NEV., by William O. Vanderburg. 66 pp. 6 figs.

I. S. 7023. RECONNAISSANCE OF PLACER MINING DISTRICTS IN IDAHO COUNTY, IDAHO, by S. H. Lorain and O. H. Metzger. 94 pp. 16 figs.

Foreign Minerals Quarterly, September, 1938. MINERAL PRODUCTION AND TRADE OF FRANCE AND FRENCH COLONIES, by Foreign Minerals Division, J. S. McGrath, Chief. 97 pp.

U. S. GEOLOGICAL SURVEY

Bull. 874-C. GEOLOGY AND FUEL RESOURCES OF THE SOUTHERN PART OF THE OKLAHOMA COAL FIELD, PART III. QUINTON-SCIPIO DISTRICT, by C. H. Dane, H. E. Rothrock, and James Steele Williams. 102 pp. 15 plates. 4 figs. 65 cents.

Bull. 886-C. GEOLOGY AND ORE DEPOSITS OF THE SOUTHWESTERN ARKANSAS QUICKSILVER DISTRICT, by John C. Reed and Francis G. Wells. 76 pp. 16 plates. 12 figs. 75 cents.

Bull. 886-D. PRELIMINARY REPORT ON THE ALUNITE DEPOSITS OF THE MARYSVALE REGION, UTAH, by Eugene Callaghan. 44 pp. 1 plate. 3 figs. 15 cents.

MISCELLANEOUS

15TH ANNUAL REPORT OF THE MARYLAND BUREAU OF MINES, (CALENDAR YEAR 1937), by John J. Rutledge, Chief Mine Engineer. 80 pp.

CALIFORNIA DIVISION OF MINES BULL. 115. Bibliography of the Geology and Mineral Resources of California for the years 1931 to 1936, inclusive. By Solon Shedd. 125 pp.

ARIZONA BUREAU OF MINES, GEOLOGICAL SERIES NO. 11, BULL. 114. Geology and Ore Deposits of the Mammoth Mining Camp Area, Pinal County, Ariz., by Nels Paul Peterson. 63 pp. 15 plates. 1 fig. 25 cents. (Free to residents of Arizona.)

PUBLICATIONS ON THE GEOLOGY, MINERAL RESOURCES AND MINERAL INDUSTRIES OF ILLINOIS, with appended index. Illinois State Geological Survey, M. M. Leighton, Chief. 112 pp.

IDAHO BUREAU OF MINES AND GEOLOGY PAMPHLET 45. Geology and Ore Deposits of the Warren Mining District, Idaho County, Idaho, by John C. Reed. (Prepared in cooperation with the U. S. Geological Survey.) 65 pp. 1 plate. 15 figs.

POWER REQUIREMENTS IN ELECTROCHEMICAL, ELECTROMETALLURGICAL AND ALLIED INDUSTRIES. Federal Power Commission, Washington, D. C. 125 pp. 7 maps. 13 figs. $1.00.

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PERSONALS

MERRILL E. SHOUP was elected president of the Golden Cycle Corporation, Colorado Springs, Colo., at a special meeting of the board of directors held recently. Shoup succeeds to the position left vacant by the recent death of Leslie G. Carlton, Colorado Springs, industrialist. Other officers elected by the directors of the Golden Cycle Corporation were: E. P. Shove, vice president and treasurer, and J. F. Underwood, secretary.

Mr. Shoup is an attorney, the son of former Governor O. H. Shoup, and has been associated with the Carlton Companies in executive and legal capacities for a number of years. He was elected a member of the Board of Directors, American Mining Congress, at the 40th annual meeting in December, 1937.

F. P. KERR has been appointed assistant division superintendent of the Keystone, Carswell and Maitland mines of the Koppers Coal Company in McDowell County, W. Va.

C. W. WATERMAN, of the Chicago office of the McNally-Pittsburg Manufacturing Company, returned early in September from Rio de Janeiro, Brazil.

E. E. STEPHENS is now superintendent of the Powellton No. 4 mine of the Koppers Coal Company, at Powellton, W. Va.

KENNETH C. BROWNELL, sales vice president of the American Smelting and Refining Company, attended the international conference of lead producers held in London early in September. It was at this conference that plans for formation of an international lead cartel were discussed.

J. F. JOY, until recently Manager of the Mining Machinery Division of Sullivan Machinery Company, has opened engineering offices at 561 Union Trust Building, Pittsburgh, Pa. This engineering business comprises three divisions of activity: The Mining Division, the Manufacturers Division, and the Contractors Division. Mr. Joy's accomplishments eminently qualify him for this larger opportunity for service to the coal mining industry.

N. L. BARGER has been made superintendent of the New Century Mine, New Century Coal Company, at Ragland, W. Va.

CHARLES E. LAWALL, director of the School of Mines, West Virginia University, was appointed acting president of the University by the Board of Governors on August 31. He assumed his new duties September 1, the effective date of the resignation of President Chauncey S. Boucher, who left the University to become chancellor of the University of Nebraska.

ROBERT V. WHITE was elected president of the Lehigh Coal and Navigation Company at a meeting of the Board of Managers of the company held September 8, in Philadelphia. He assumed his new duties on September 16.

RAY W. ARMS, formerly of Roberts and Schaefer Company, is now preparation manager for the Valley Camp Coal Company, of Cleveland, Ohio. He can be reached care of the company at Wheeling, W. Va.

—*Obituaries*—

CHARLES F. HAMILTON, vice president in charge of operations, Binkley Coal Company, died September 22 in Chicago, Ill., at the age of 63, after an illness of several months.

After graduating from Cornell University, Mr. Hamilton spent a number of years in engineering work in Pennsylvania, following which he became active in the operation of Illinois coal mining properties in 1921. He had been vice president of the Binkley Coal Company for ten years preceding his death.

Mr. Hamilton was a past president of the Illinois Mining Institute, and in 1935 was national chairman of the Program Committee of the Coal Mining Convention, the American Mining Congress.

LESLIE G. CARLTON, one of the West's best known industrialists and the leading figure in Cripple Creek, Colo., mining, milling and railroad interests for many years, died at Cripple Creek September 4 after a month's illness. His age was 65.

Mr. Carlton, along with his brother, the late A. E. Carlton, who died in 1931, had been closely associated with the mining industry for some 42 years, the rise of the Carlton brothers forming an epic in the development of the West, particularly in the Cripple Creek gold mining district, where for the last 25 years Cripple Creek has been synonymous with the Carlton interests.

Sandvik Mining Drill Steel

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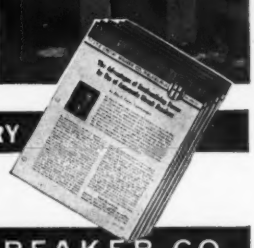
Raise production; reduce fire hazard; lower maintenance charges; decrease total energy consumption and power demand. These advantages with Automatic Reclosing Circuit Breakers are fully described in I-T-E bulletins based on actual installations in mines.

At right—Each circuit breaker controls a section, confining disturbances to the area in which they arise.

Representatives in Principal Mining Areas



BULLETINS TELL THE STORY

These bulletins deal with a variety of mining conditions. Copies will be gladly furnished on request.

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PHILADELPHIA, PA.

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(Coal Mining Division)

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Completely equipped Power Plant including one 750 KW and one 1,250 KW General Electric alternating current condensing turbo generator set; five 250 h.p. and three 200 h.p. B&W water tube boilers. Also two 300 h.p. electric hoists, four Goodman 6-ton mine locomotives, seven Goodman mining machines 42″ gauge, one 8′ 6″ Vulcan mine fan, 200 r.p.m. silent chain drive, 200,000 cu. ft air at 3″ water gauge with 150 h.p. motor. Also other items of coal mine equipment. Send for complete list. Mine closed.

THE OWL CREEK COAL COMPANY
GEBO, WYOMING

MANUFACTURERS' Forum

Strain Clamp Loop Aids Conductor Stringing

To simplify the job of dead-ending small conductors the Ohio Brass Company, Mansfield, Ohio, has added a loop under the nose of its small Hi-Lite strain clamp, making it possible to attach the "blocks" for securing proper conductor tension directly in the clamp. When the tail block is hooked in the new loop and the conductor is brought to tension, the entire

dead-end assembly assumes a position that is practically a continuation of the conductor. In addition to simplifying the procedure of dead-ending, the loop permits more accurate sagging and makes hot-line work easier and safer.

The loop is an integral part of the clamp body casting and has ample strength for any tensions to which it may be subjected. The Hi-Lite with this new feature accommodates 0.35 to 0.55-in. conductors when unlined and 0.30 to 0.45-in. conductors when furnished with liners.

Also announced by Ohio Brass is a new heavy duty section insulator switch for sectionalizing mine trolley

circuits. This device, known as the M-6 switch is distinguished by heavy copper section throughout and is designed for current up to 1,000 amperes. Adjustable feeder lugs will easily accommodate feeder cable up to 500,000 C.M. Operation is easy and positive, the operator being protected by a heavy rubber handle. The switch may be locked so as to permanently break the circuit.

M. S. A. Bulletin Boards

Mine Safety Appliances Company, Pittsburgh, Pa., has just issued a new informative bulletin describing their specially designed bulletin boards for safety and general bulletins. These boards are used extensively by both large and small companies for supplementing safety and educational programs. They are sturdily built of 24 gauge steel, finished in green enamel and are available in either single or double board types.

Copies of this bulletin may be obtained by writing the manufacturer direct or through this publication.

Improved String-A-Lite

Sullivan Machinery Company has announced new improvements in String-A-Lite, the moisture-proof lighting cable that provides the safety

and utility of a permanent installation with the wiring simplicity of a temporary job.

String-A-Lite consists of No. 10 two-conductor rubber-covered cord on which moisture-proof end connectors and lamp socket connectors are integrally molded. Detachable lamp sockets are of molded rubber or bakelite with prong type connectors.

String-A-Lite is easily and quickly installed and taken down. No special wiring or insulation are required. It can be made to suit your requirements, any length and with any desired lamp spacing. Write to Sullivan Machinery Company, Michigan City, Ind., for prices and illustrations.

Roebling Branch Office

John A. Roebling's Sons Company, Trenton, N. J., announces the establishment of a branch office and warehouse on August 1 at 855 North Avenue, West, Pittsburgh, Pa., to carry a complete line of wire rope and insulated wire.

Sandvik Steel Opens Los Angeles Office

In order to better accommodate their Pacific coast clientele, the Sandvik Steel Company, of Sandviken, Sweden, has recently opened a branch office in Los Angeles, operating under the name of Sandvik Steel of California, with Mr. O. R. Hiler as manager.

The Sandvik steel products comprise hot rolled and forged steel, hardened and unhardened strip steel, wire, tubing, and hollow and solid drill steel. One of their specialties is conveyor belts manufactured from cold rolled, hardened and tempered carbon as well as stainless steel.

Sandvik Steel Company began the manufacture of high quality cold rolled steel in 1883. In their work today hardened and tempered cold rolled strip steel may be manufactured in widths up to 32 inches, and cold rolled, unhardened strip steel is rolled as thin as .00012 inch.

For the past 30 years the company has been manufacturing steel conveyor belts, during which time it has not only developed manufacturing methods to produce satisfactory steel strip for conveyor belt service, but has also followed very closely many installations handling all kinds of different products, and has accumulated much experience in manufacturing and engineering successful installations.

Steel belts are now manufactured

You can save $1.00 per tie per year with Bethlehem Steel Ties

PERFORMANCE records of Bethlehem Steel Ties show amazing savings. Used in rooms of mechanized mines, these ties have saved $1.00 and more per tie per year, compared with wood ties. This is over and above the cost of the ties.

One big saving comes in labor. It takes approximately half as long to lay or remove track when Bethlehem Steel Ties are used. This means the saving in labor alone pays the entire cost of the ties every 10 or 12 times the track is relaid.

Another saving is in the material costs. Steel ties do not become spike-killed by frequent changes of track. They should last from five to eight times as long. This longer life means that initial cost for a set of steel ties is less than that for the five to eight sets of wood ties—by as much as 50 per cent.

There are other savings to be considered. No spikes are used; there are none to be lost. Machines can be kept in more constant production; there is little hold-up while new track is advanced to the face. Track will be better; Bethlehem Steel Ties not only securely anchor the rails—they accurately gage them as well. These mean higher speed and fewer derailments.

Once you try Bethlehem Steel Ties, you will realize how important these savings are. May we have a sales engineer call on you?

BETHLEHEM STEEL COMPANY, *General Offices:* Bethlehem, Pa. *District Offices:* Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Detroit, Honolulu, Houston, Indianapolis, Johnstown, Pa., Kansas City, Mo., Los Angeles, Milwaukee, Nashville, New Haven, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, Salt Lake City, San Antonio, San Francisco, Savannah, Seattle, Syracuse, Toledo, Tulsa, Washington, Wilkes-Barre, York. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

in widths varying from 12 in. to 32 in., and in lengths of 500 ft. to 350 ft., respectively, depending on the width of the belt. The belts are manufactured from high carbon Swedish steel, hardened and tempered after cold rolling. The belt is then especially prepared for conveyor belt service and carefully inspected. In recent years the company has been manufacturing steel belts in the same widths made of 18-8 quality stainless steel.

Due to the ability of the belt to withstand a given amount of temperature, hot materials of all kinds can be handled on a Sandvik belt. Sticky material which would adhere to the belt can be easily handled, as a steel scraper can be used against the surface of the belt removing all material at each revolution.

The field of uses for a Sandvik belt in industry is very broad. Not only is the belt satisfactory for handling materials in bulk, especially where it is necessary to scrape them off at one or more points along the conveyor but the material can be scraped off cleanly with a minimum of breakage.

The company will be very glad to receive inquiries from any prospective customers, and also be glad to put at their disposal their experience in designing steel belt conveyors. The Link-Belt Company, Pacific Division, represent Sandvik steel in the sale of steel conveyor belt.

Coal Drills

A completely new line of coal drills has just been announced by the Black & Decker Mfg. Co., Towson, Md., to make available the full operating economy of closer shot holes for use of lighter powder charges in both hard coal and soft coal operations. It is claimed that this efficient mining practice will produce up to 20 percent more lump coal.

The new coal drill line consists of four different size tools suitable for one-man and two-man operation. These drills are reasonably priced, of very rugged construction, though light in weight and a selection of speeds is offered to meet varying drilling requirements. They are supplied with spade handle or breast plate, full capacity dust-proof switch and detachable pipe handle.

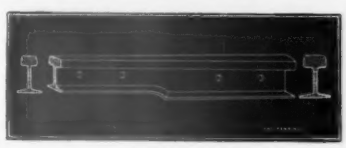
Gears are mounted on ball bearings and spindle on Timken tapered roller bearings. Spindle is threaded to accommodate various standard augers, sockets or adaptors. Reversing switch can be supplied for three of the models.

These tools are available for either alternating or direct current and for 110, 220 and 250 volts.

Transition Rail

The Portable Lamp and Equipment Company, 77 First Avenue, Pittsburgh, Pa., announces a new "Transition Rail" for joining two different size rails into a smooth transition of great strength. The overall length is approximately 26 in.

The Transition Rail makes perfect rail joints at each end. No "rights" or "lefts" are required, and standard



fishplates, or angle bars, are used to make the joints and reinforce the entire length. Bonding is accomplished with continuous bond around the rail. Standard stock sizes include 60 lb. to 40 lb., 60 lb. to 30 lb., 60 lb. to 25 lb., and 40 lb. to 25 lb. rails. Other sizes can be furnished on request.

The Portable Lamp and Equipment Company will be pleased to send informative new literature upon request.

CATALOGS and BULLETINS

• BOILER SERVICE EQUIPMENT. *Roots-Connersville Blower Corporation*, Connersville, Ind. Form L14D is a new price list applying to the boiler service equipment described in the company's bulletin 260-B14B. Prices are uniformly lower, and several new sizes have been included, which widens the range of application for which these units have been especially designed and built.

• CABLE AND WIRE STRIPPERS. *Ideal Commutator Dresser Co.*, 1234 Park Ave., Sycamore, Ill. Form WSB-738 describes the company's line of hand, foot and motor-driven cable and wire strippers and cutters. 6 pages.

• COMPRESSORS. *Sullivan Machinery Co.*, Michigan City, Ind. Bulletin A-22 describes and illustrates the company's new Unitair stationary and semi-portable air compressors. A number of refinements and improvements have been made to this popular line of compact, two-stage air-cooled compressors, which are fully described in the bulletin. The current Unitair compressor is available for displacements ranging from 107 to 435 cubic feet per minute and for commercial pressures up to 125 pounds per square inch. 20 pages.

• CRUSHERS. *Traylor Engineering & Manufacturing Co.*, Allentown, Pa. Bulletin 2112 presents detailed specifications of the company's Type TY Reduction Crusher, together with instructions for the assembly, erection, lubrication, operation and repair of this type of equipment. 22 pages.

• DIESEL TRACTORS. *Caterpillar Tractor Co.*, Peoria, Ill. Form 4876 presents capacities, specifications and mechanical features of the largest "Caterpillar" Diesel Tractor. Printed in two colors, the book is profusely illustrated, the pictures showing action views of the Diesel D8 tractor on the job, as well as cutaway views of the engine, fuel system, transmission, final drive, etc. 32 pages.

• EXPLOSIVES CARRIER. *Mine Safety Appliances Co.*, Pittsburgh, Pa. Bulletin BH-2 describes the company's explosives carrier No. 12, which was developed to meet the demand and need for a safer and more substantial explosives container than heretofore was available. This new carrier is molded of bakelite, is non-conductive of electricity, and is moisture proof. This bulletin also describes briefly the M.S.A. shot firing unit and attachments. 2 pages.

• FUSES. *Westinghouse Electric and Manufacturing Co.*, East Pittsburgh, Pa. Booklet F. 8450 describes the company's Dry Boric-Acid power fuses used for the protection of high voltage circuits and equipment, applicable in utility and industrial power plants, and for all high-voltage power use, both indoor and outdoor. Voltage ratings are from 7,500 to 34,500 volts for circuits 440 volts and above and current ratings are from ½ to 400 amperes. 8 pages.

• GEARS. *Condenser Service and Engineering Co.*, 310 Twelfth St., Hoboken, N. J. Circular describes the company's new development termed the Universal Bevel Gear. This is so designed as to operate freely and easily through an angle of 135 degrees, which makes it desirable to be used in conjunction with valves difficult to reach or for any other remote control application. It eliminates the hazards of climbing ladders, etc., to open and close valves.

• LIFTING EQUIPMENT. *R. G. LeTourneau, Inc.*, Peoria, Ill. and Stockton, Calif. Form C-606 describes the advantages of lifting and carrying heavy loads with tractor power. Many applications of the use of the LeTourneau crane powered by a tractor are illustrated, the crane having all the mobility of a tractor and lifting with all the power of its engine, transmitted through a standard LeTourneau power control unit. 6 pages.

• MATERIAL HANDLING EQUIPMENT. *Bucyrus-Erie Co.*, South Milwaukee, Wis. Circular MP-W7 presents advantages and applications of the company's modern two-wheel scrapers.

• SWITCHES. *The Trumbull Electric Manufacturing Co.*, Plainville, Conn. Circular 300 presents construction details and applications of Type "R.B.A." heavy duty industrial switch. 4 pages.

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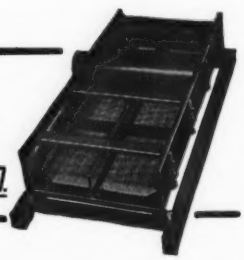

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